The Oil Industry's Answer Today 15 Cents a Copy

The OIL and GAS JOURNAL

PRODUCING REFINING MARKETING

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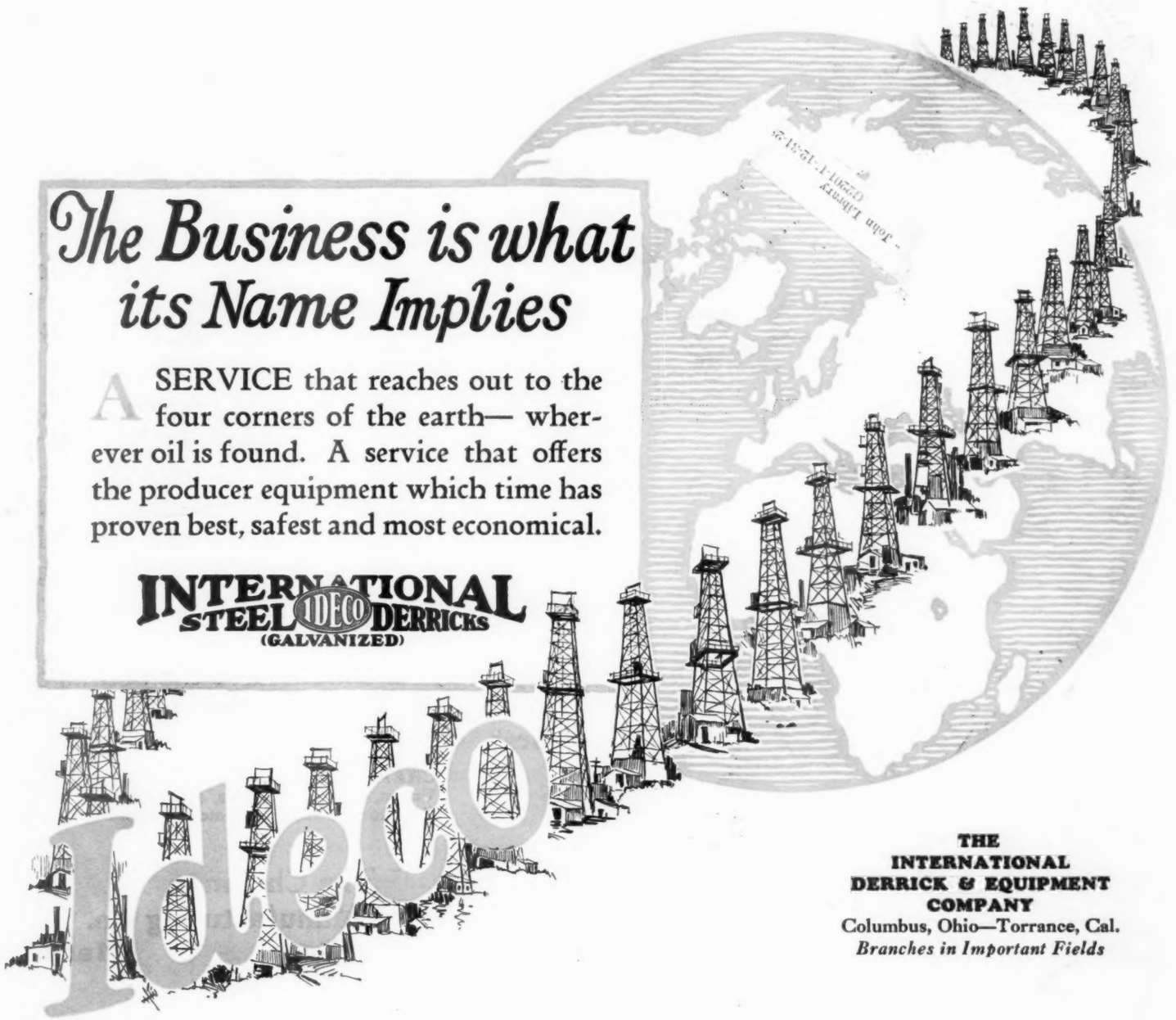

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Advertisers' Index on Page 41 Table of Contents on Page 42

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The Oil and Gas Journal, issued weekly by The Petroleum Publishing Company, 114-116 West Second Street, Tulsa, Oklahoma. Subscription price $6.00 a year; 15 cents a copy. Entered as second-class mail matter December 15, 1911, at th e post office at Tulsa, Okla., under the Act of March 3, 1879

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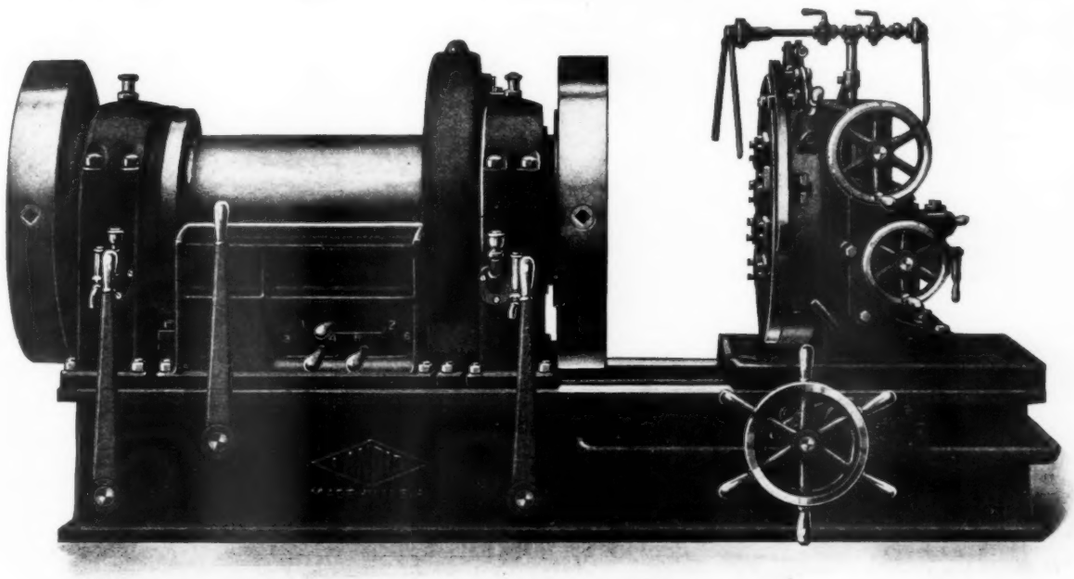

The new line of Landis Pipe Threading and Cutting Off Machines was designed to support the Landis Die Head in the proper manner and to obtain the maximum efficiency with the Landis Head and Chaser.

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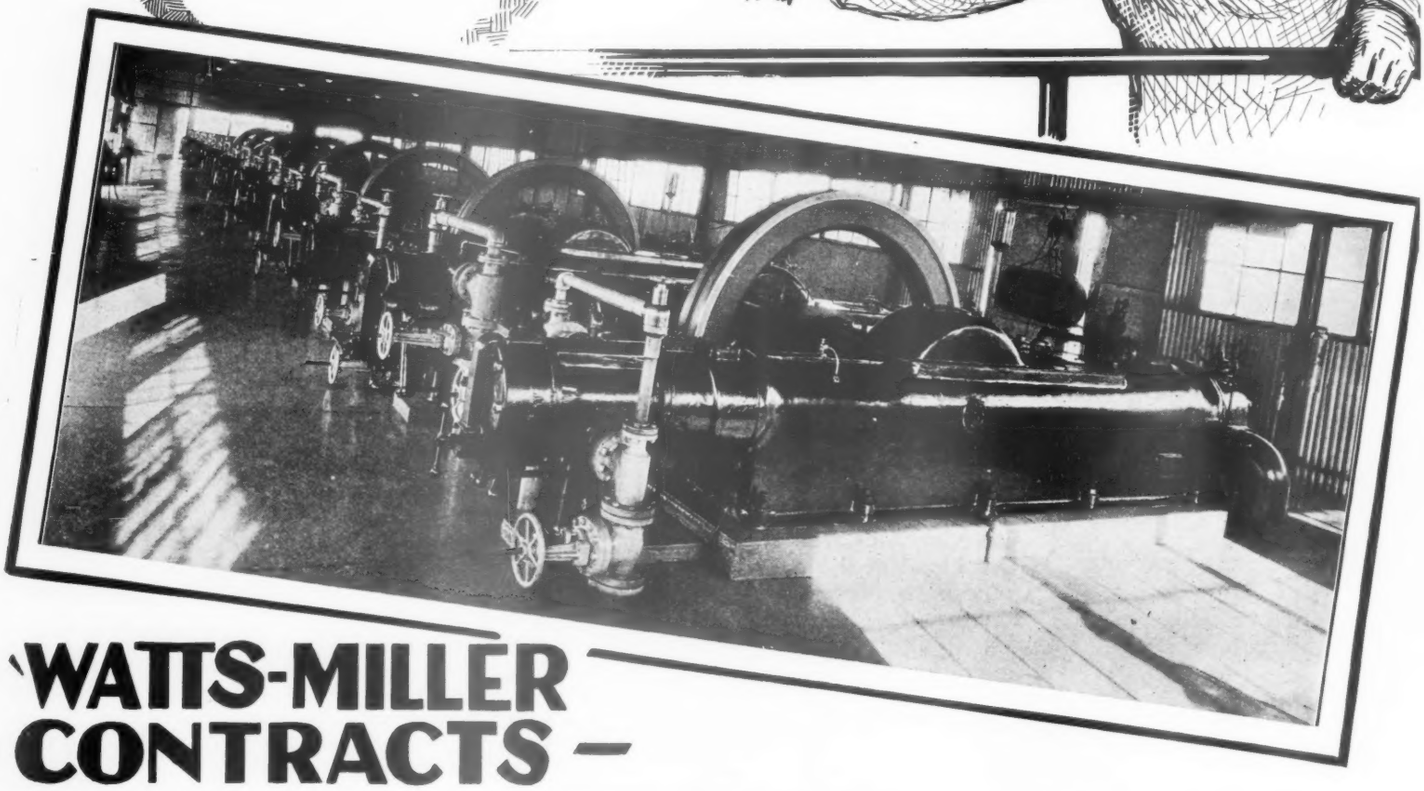

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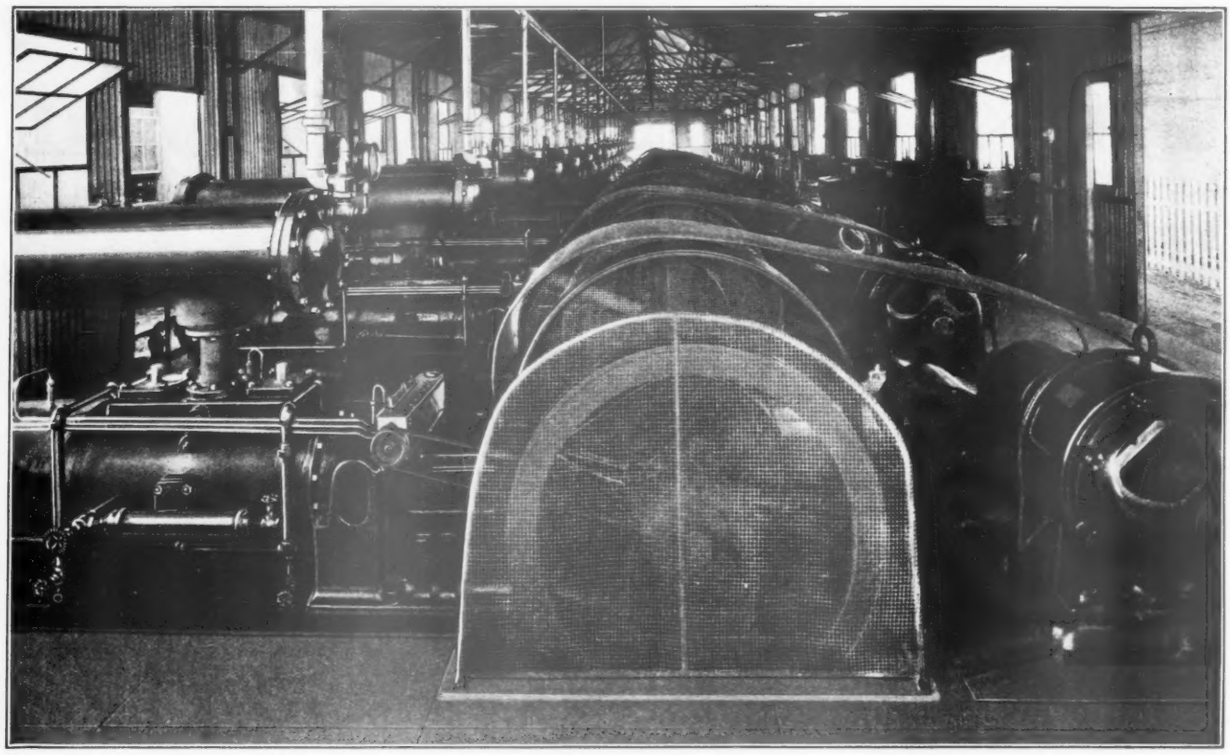

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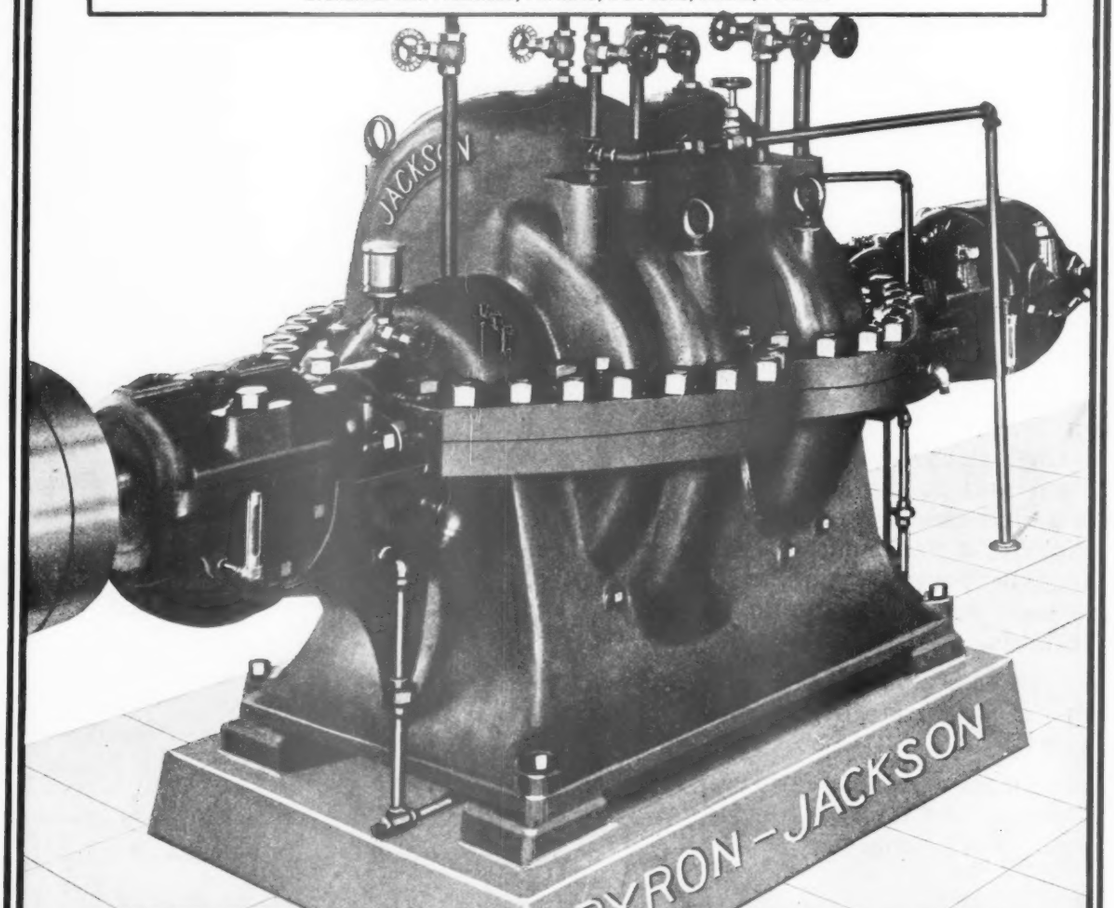

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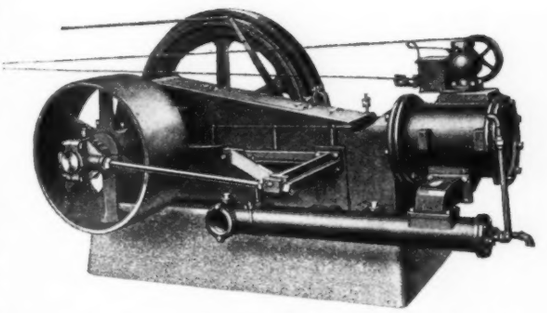

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Gas engines can never deliver more than their rated horse power. On the other hand, by increasing the boiler pressure, the power delivered by an Ajax *Steam* Drilling Engine can be doubled, and the operating time still further reduced.

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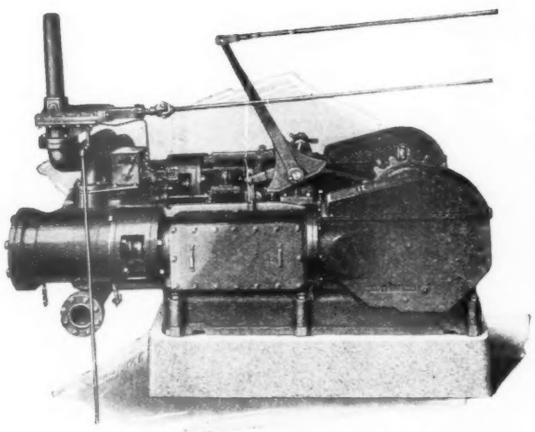

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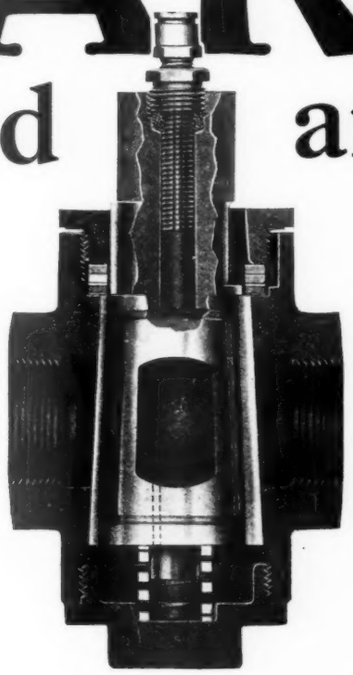

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for meter by-pass lines

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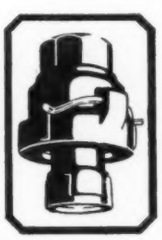
BARCO



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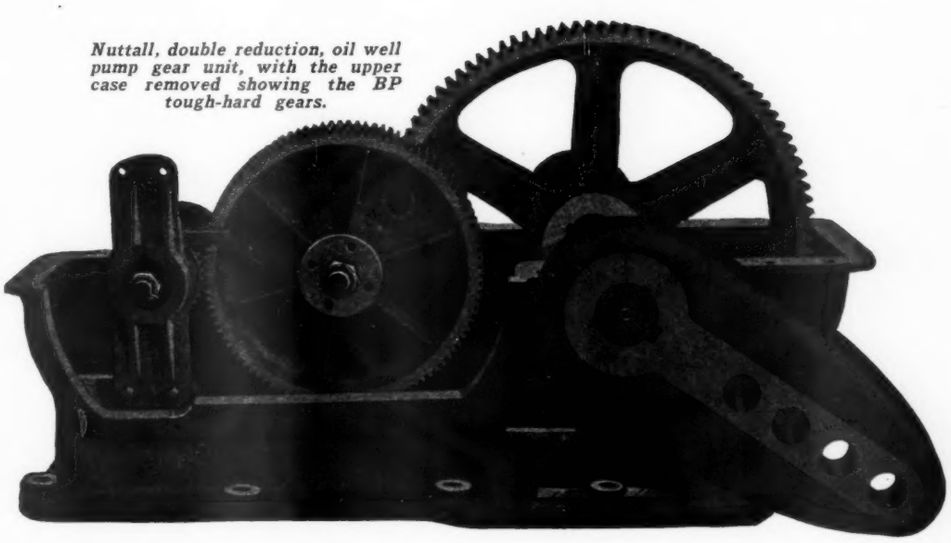

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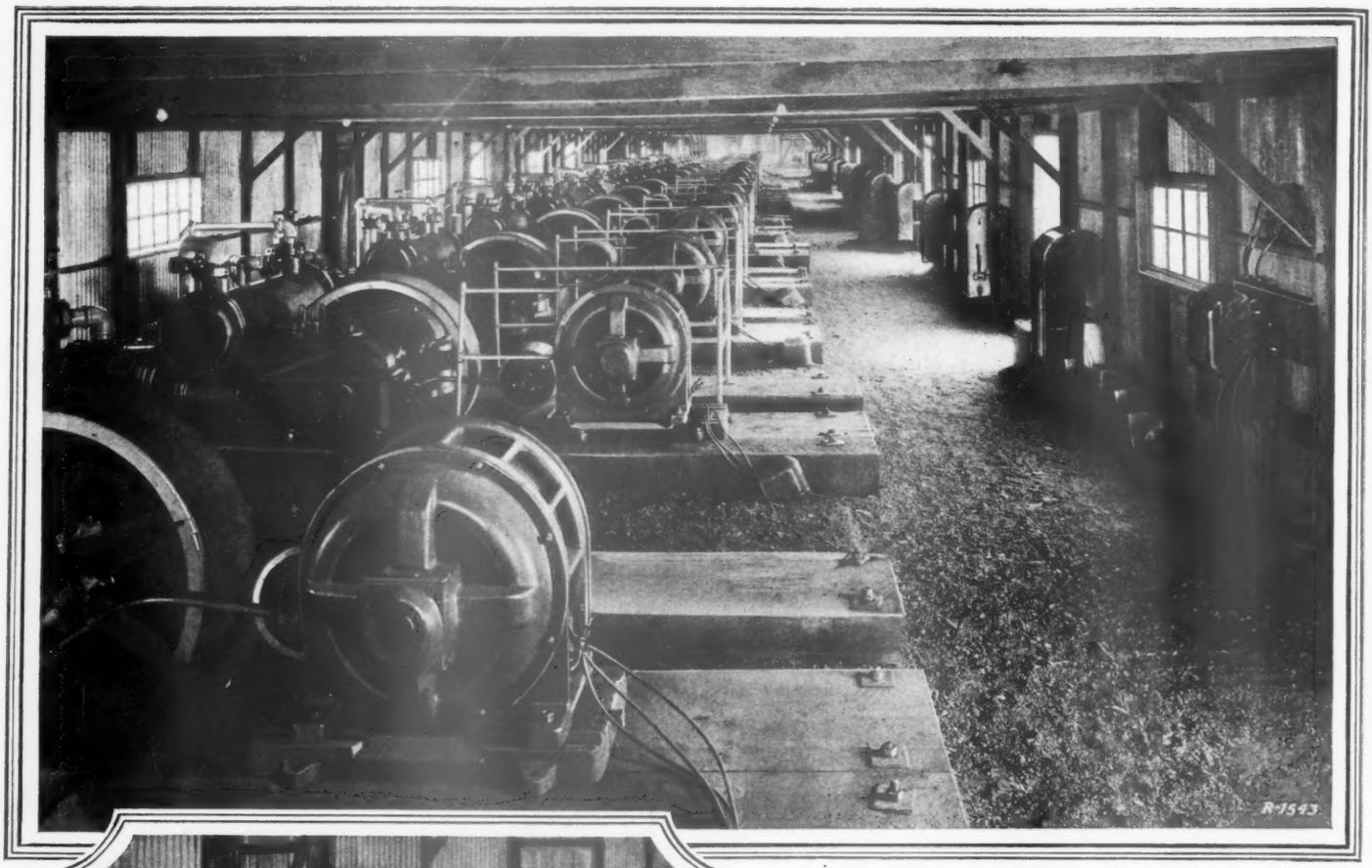

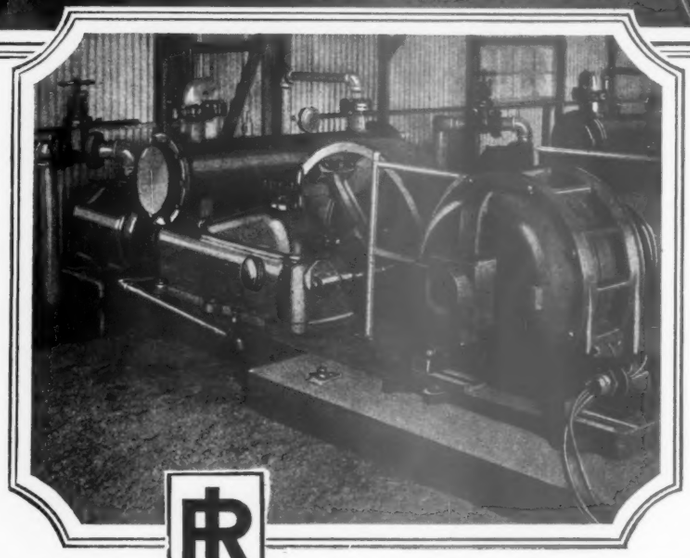

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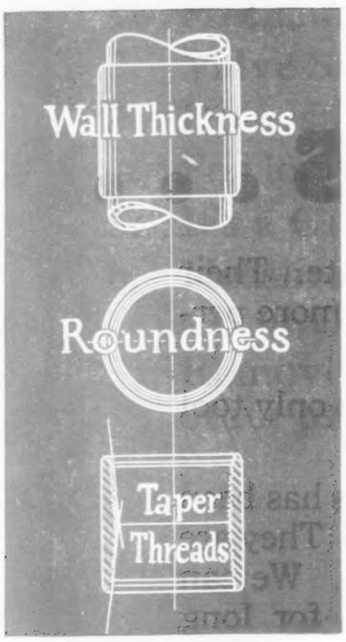

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Make Pipe Interchangeable

Every Smithsteel A.P.I. Casing Coupling is accurate to the A.P.I. Standard for pitch, taper and thread.

Every A.P.I. Smithsteel Coupling *will fit* A.P.I. pipe of the same standard.

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Complete factory stock is maintained in the field for reconditioning work.

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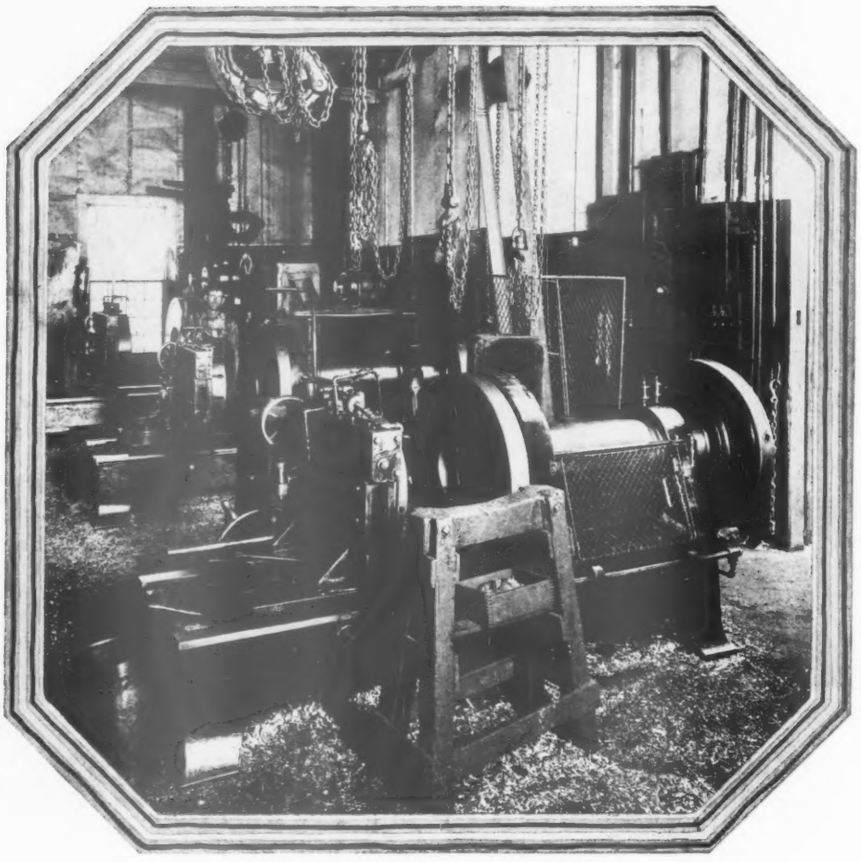
The Standard of the Oil Fields for Reconditioning Pipe



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6. Measures natural—manufactured—acetylene gas or air.
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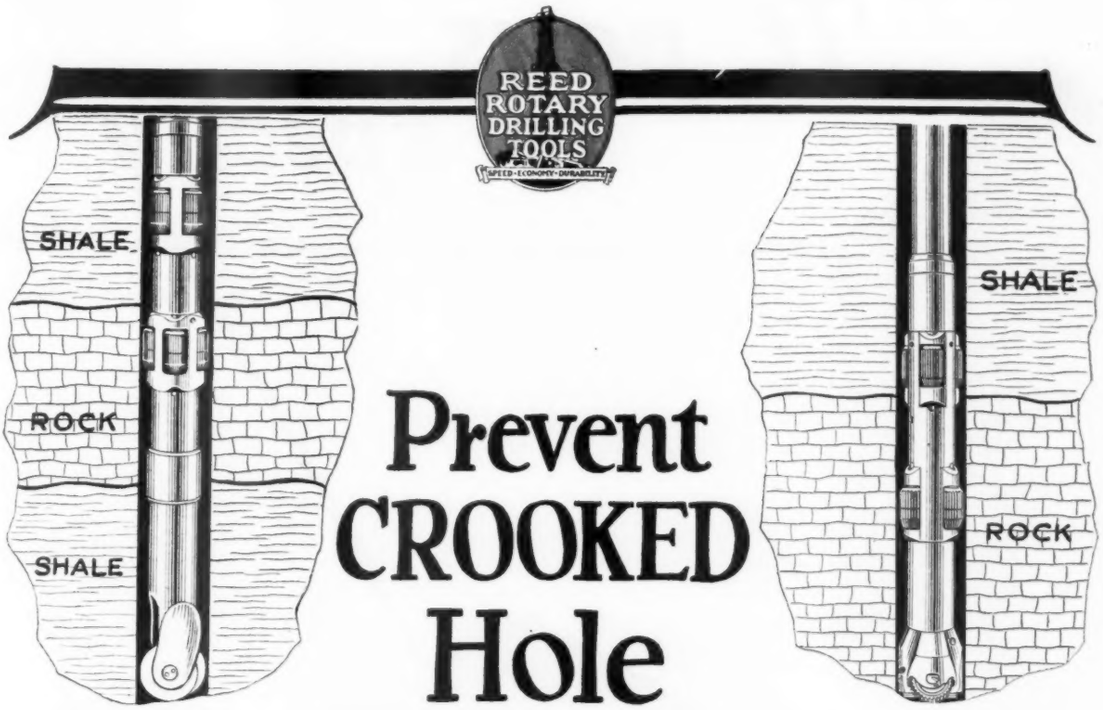


Prevent CROOKED Hole

EVERY operator knows that a crooked hole usually results in much grief.

Those who have used a Reed Double Three-Point or a Double Four-Point Reamer on the drill stem, right behind a fishtail or a disc bit, have found that this stiff, rigid member, with its many points of contact, tends to keep the bit in its straight, downward course—even though boulders and slanting formations are encountered.

A straight, full-gauge hole is assured in one operation, and all of the time usually consumed in after-reaming is saved. Casing slips in as though it were greased.

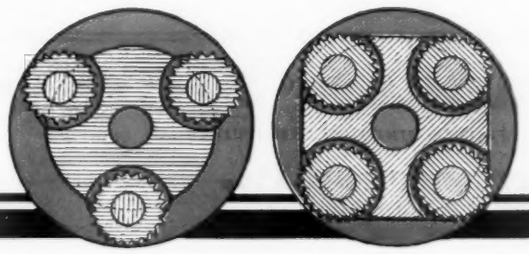
REED ROLLER BIT COMPANY

Houston **Los Angeles**

We are distributors for the Martin-Loomis Weight Indicators east of the Rocky Mountains

Reed Reamers

The Reed Double Three-Point Reamer leaves 35% of the hole clear.



The Reed Double Four-Point Reamer leaves 28% of the hole clear.

It pays to specify

SIZES
⅛" TO 24"
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Steel Casing

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1828

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Engineers of leading companies are using Cooke Seal Rings

Engineers of such companies as Standard Oil (of New Jersey, Indiana and California), Sinclair, Shell, Sun and others have bought and installed Cooke Seal Rings.

Because Cooke Seal Rings put an end to leaks, to packing troubles, to friction troubles.

You likewise can get rid of such troubles *forever* if you take the tip from these experienced men.

Bound leak-proof and frictionally tight *on,* and rotating *with* the shaft, instead of pressing against it —the Cooke Seal Ring makes a leak-proof contact against the gland. A ground joint! Friction reduced by 90%! Only 3/16 inch ring of bearing surface! Eliminates packing in the stuffing box.

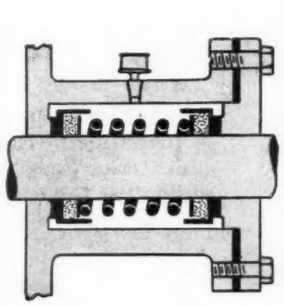
The Cooke Seal Ring is a simple mechanical device, correct in engineering principles and perfect in performance.

Developed in the ammonia refrigerating field, Cooke Seal Rings are today in world-wide use for maintaining a leakless pressure (or vacuum) on a wide range of gases, fluids and air.

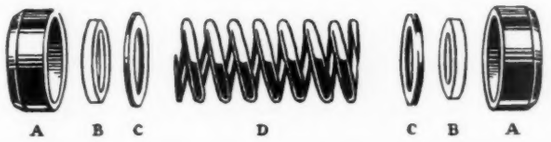
Without renewals, maintenance or service (except for oiling) Cooke Seal Rings have been giving perfect service on constant-duty machinery for as long as 6 years. Nor is any appreciable wear detectable.

Engineers and others interested in problems of maintaining pressure or preventing leaks around a revolving shaft will be very much interested in a booklet which we have just issued. It tells fully about this revolutionary invention.

Without incurring the least obligation, why not send for a copy? The coupon, filled out or attached to your letterhead, will bring it by return mail.



a—The Cooke Seal Ring, itself
b—Rubber packing
c—Follower ring
d—Helical spring



The entire assembly is lubricated and sealed with oil from the stuffing box, now used as an oil reservoir.

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PARKERSBURG *All-Steel* Rigs are a better investment. They bring you definite economies that cause your drilling and pumping equipment to yield greater returns.

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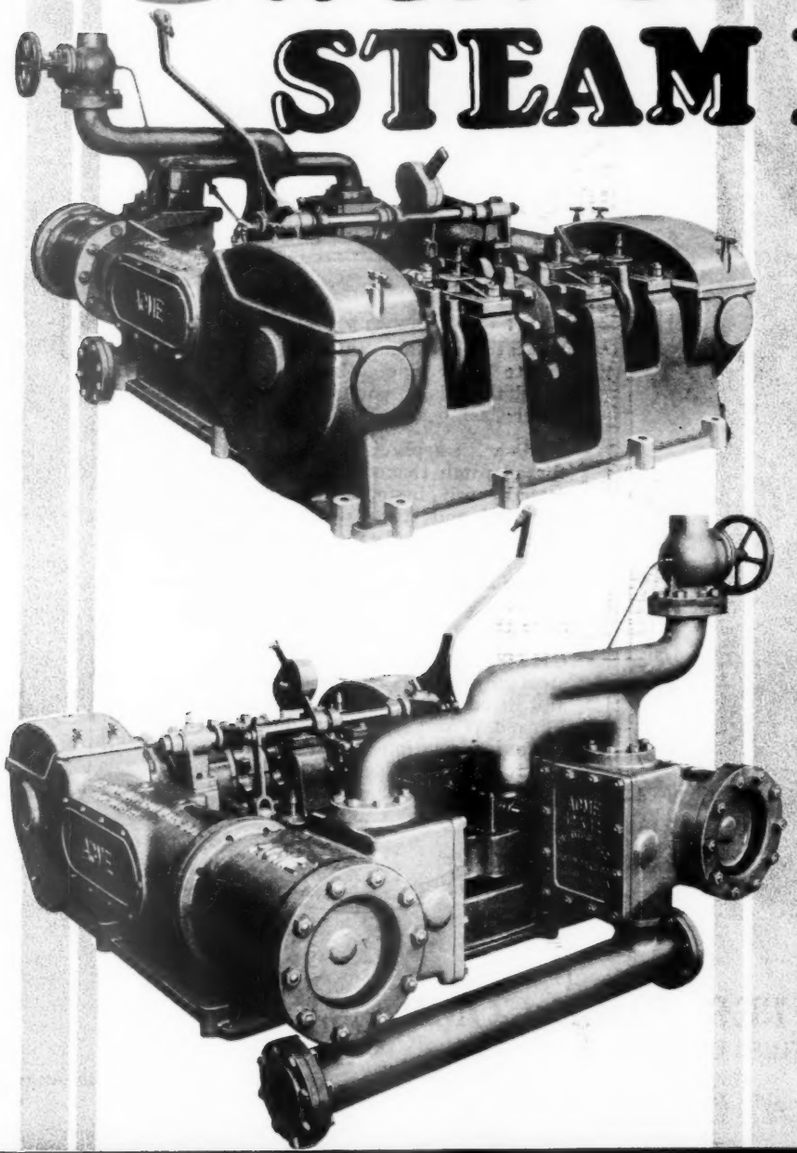

The Titusville Acme Twin Cylinder Steam Engine is always efficient, always reliable for all kinds of oil well drilling operations.

Examine its design and construction from every angle—note the completely enclosed working parts and the water drain on the steam manifold.

Consider the long life advantages of four separate main bearings with interchangeable babbitt liners and caps die cast for quick replacement in the field, and the highly efficient splash lubricating system—then you'll realize why the Acme Steam Engine is the most dependable steam power unit money can buy.

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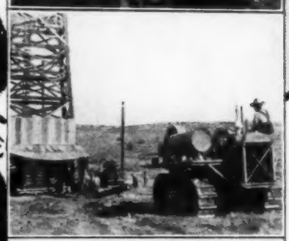
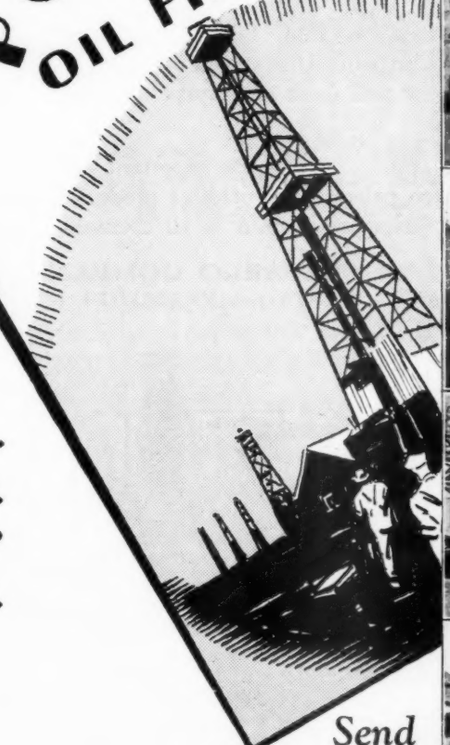


"CATERPILLAR" POWER IN THE OIL FIELDS



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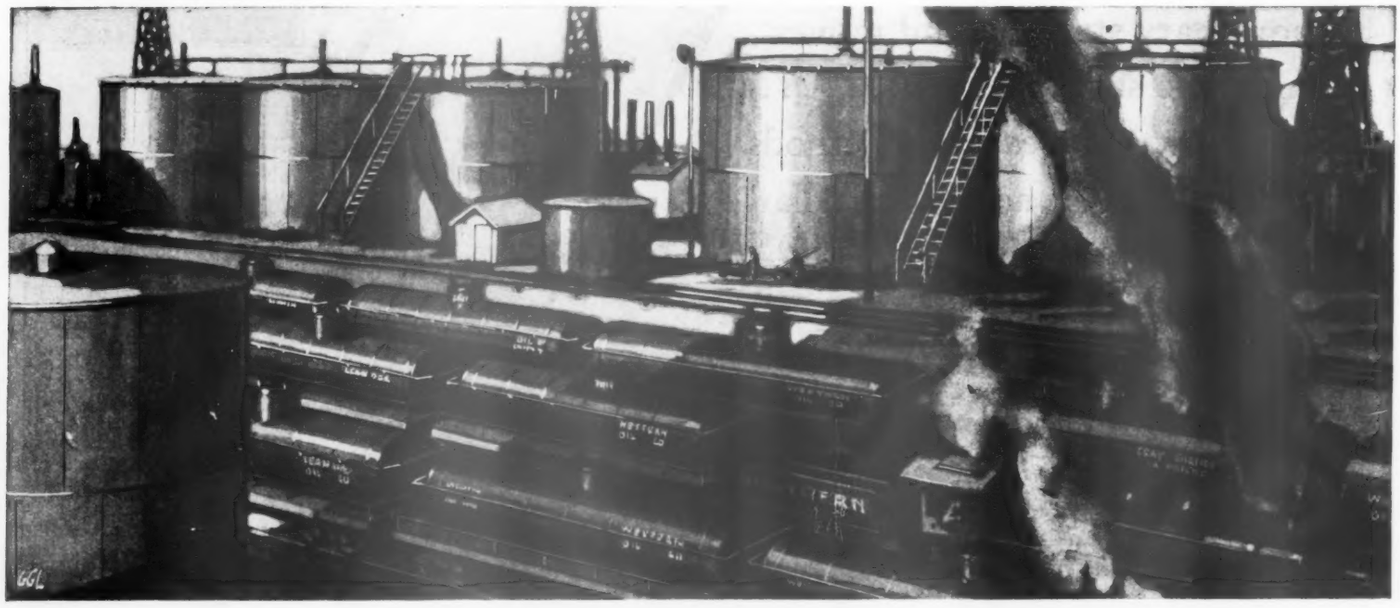

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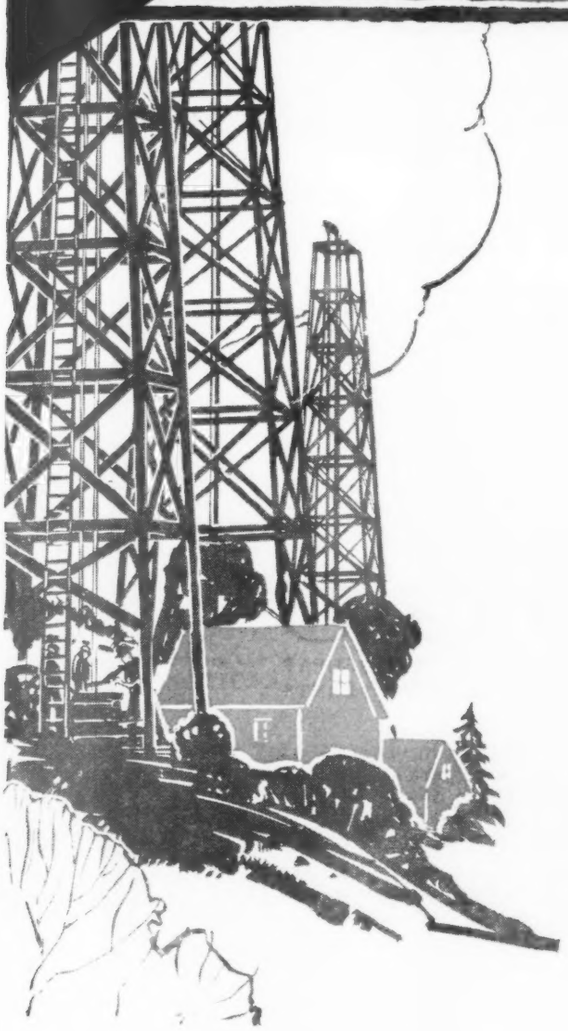

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and— it reached the sand!

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Collar	1 3/8"	1 1/2"	1 11/16"
Square	13/16"	1"	1 1/16"

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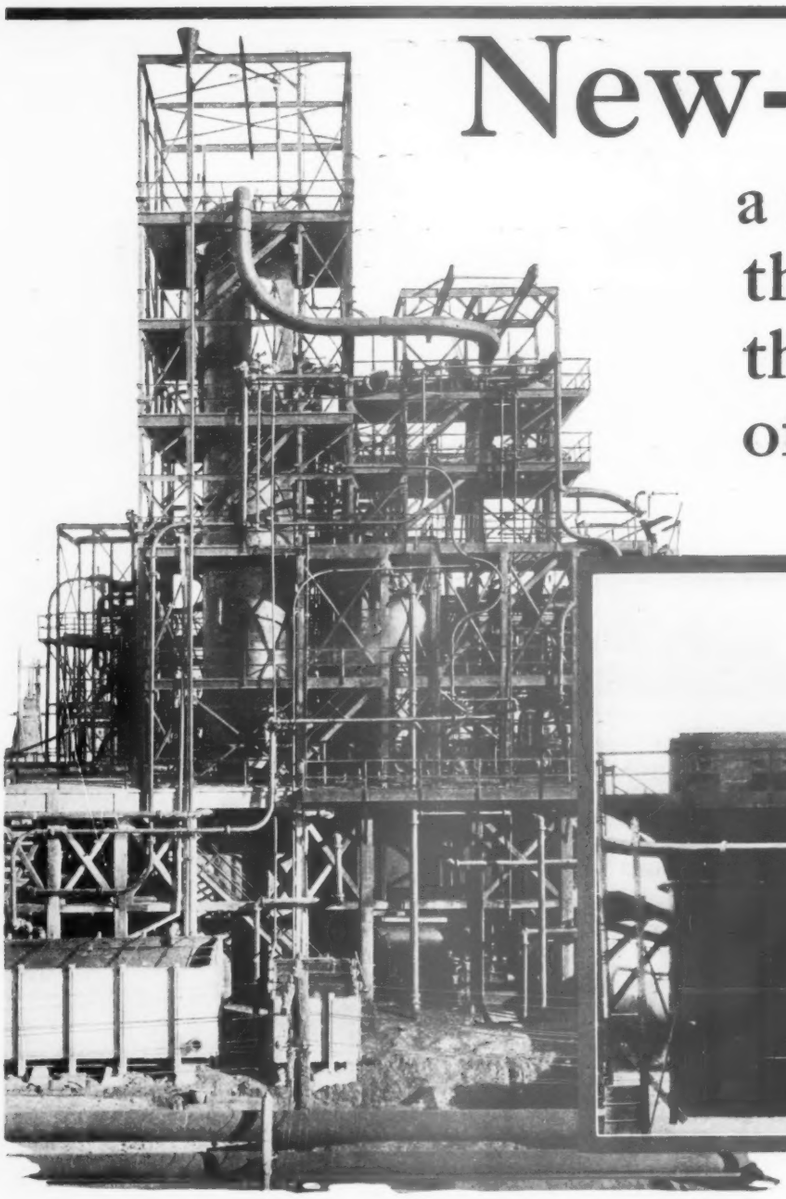
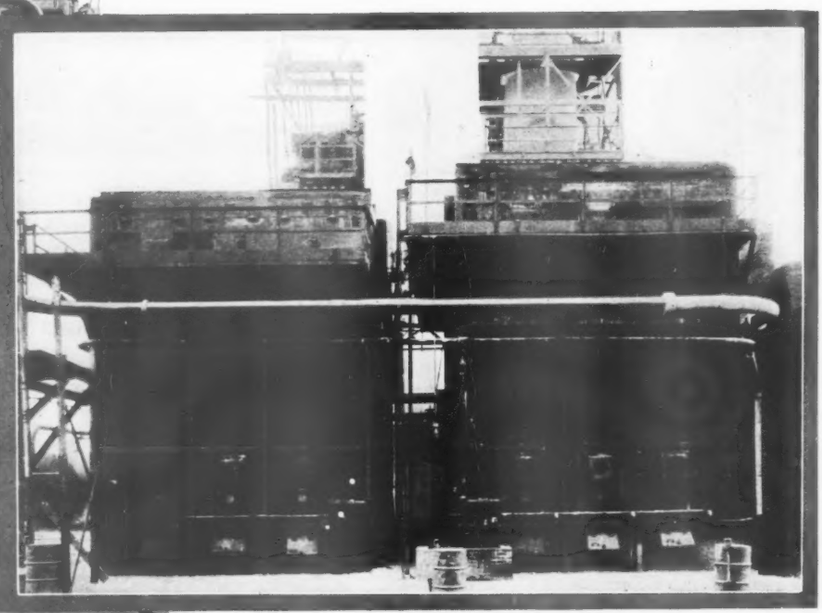
New—

a fractionating tower that parallels the performance of Foster Tube Stills





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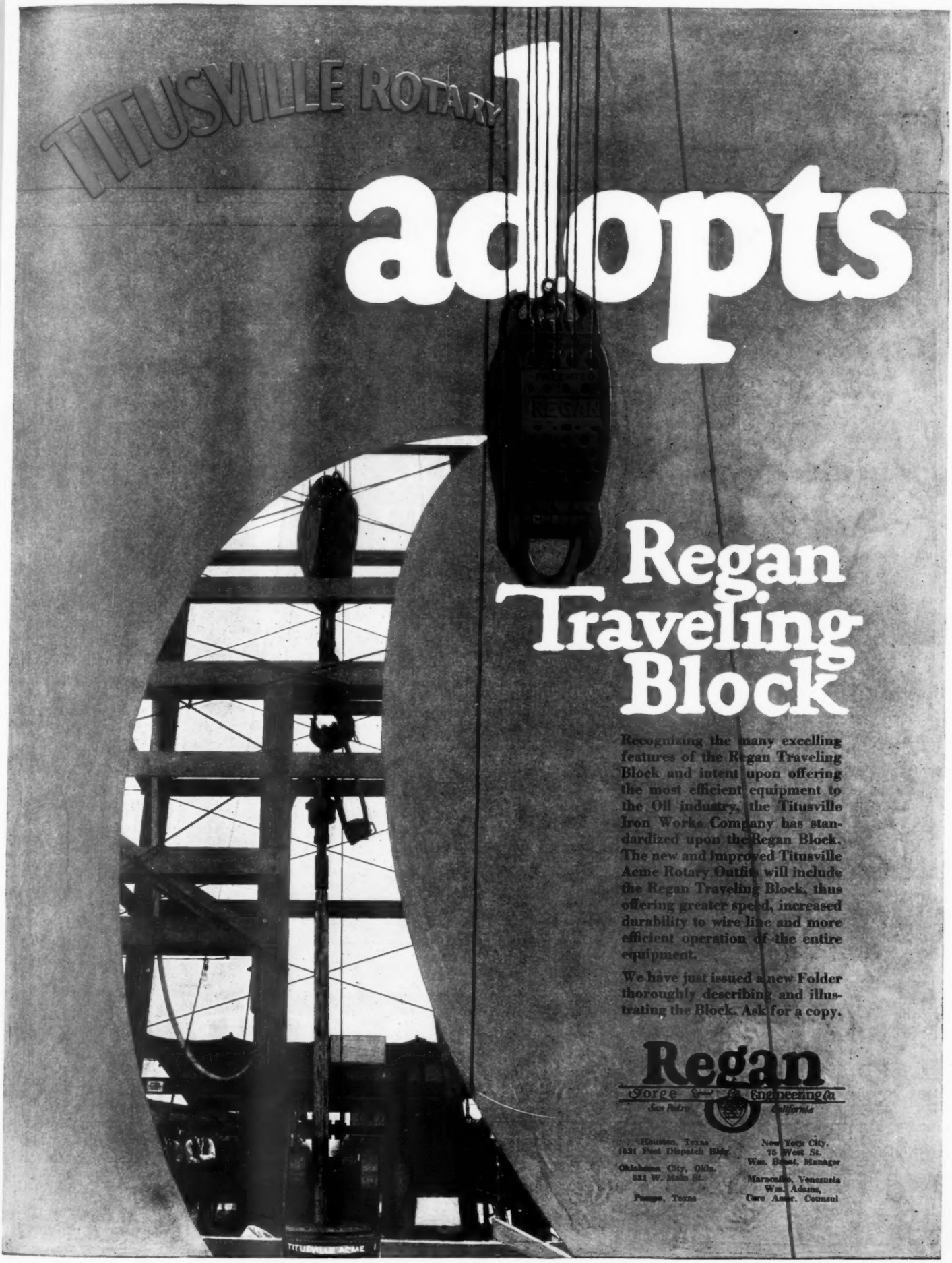
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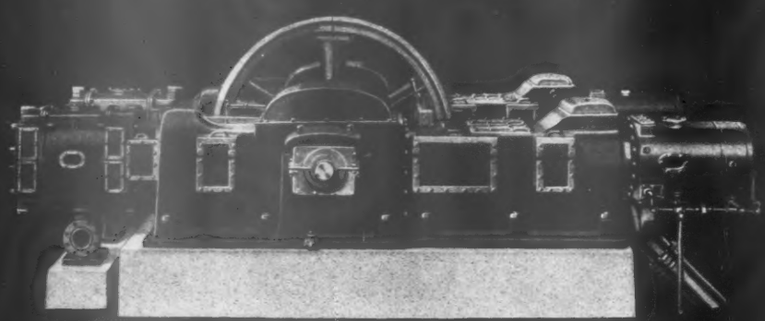

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This FAIRBANKS-MORSE Vertical Diesel Heavy Duty Engine, using crude or fuel oil, has been designed especially for beam well pumping, swabbing, drilling or powers.

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Light Oil Producing Areas Hopeful

Highest daily average estimated production in 1926, week ended Dec. 25, 2,385,139 bbls. Lowest in 1926, January 30, 1,915,960 bbls.

Cost of Refining West Texas Crude and California Production Will Have Important Bearing on Price Structure

By Andrew M. Rowley

Highest daily average estimated light oil production in 1926, week ended Dec. 25, 1,797,349 bbls. Lowest in 1926, Jan. 30, 1,371,600 bbls.

Realizing there is no immediate relief in sight from the overproduction situation, at least as far as the country as a whole is concerned, oil men are viewing conditions more and more from the standpoint of the quality of crude produced in different areas and the effect costs of refining will have upon the crude oil price structure. It will cost more to refine West Texas crude than it does Seminole crude or the product of other light oil fields. Just how much more depends upon the success attending efforts to solve the corrosion problems encountered in the handling and refining of that crude.

Three main producing areas will control the situation the remainder of this year and practically all of next. These are Oklahoma and Kansas where production will decline during the next few months, probably until late next spring; West Texas, which will continue to register increases in output as facilities for handling the crude are made available; and California, where developments are expected to result in further increases in production with indications the average daily output will be maintained well over 600,000 barrels.

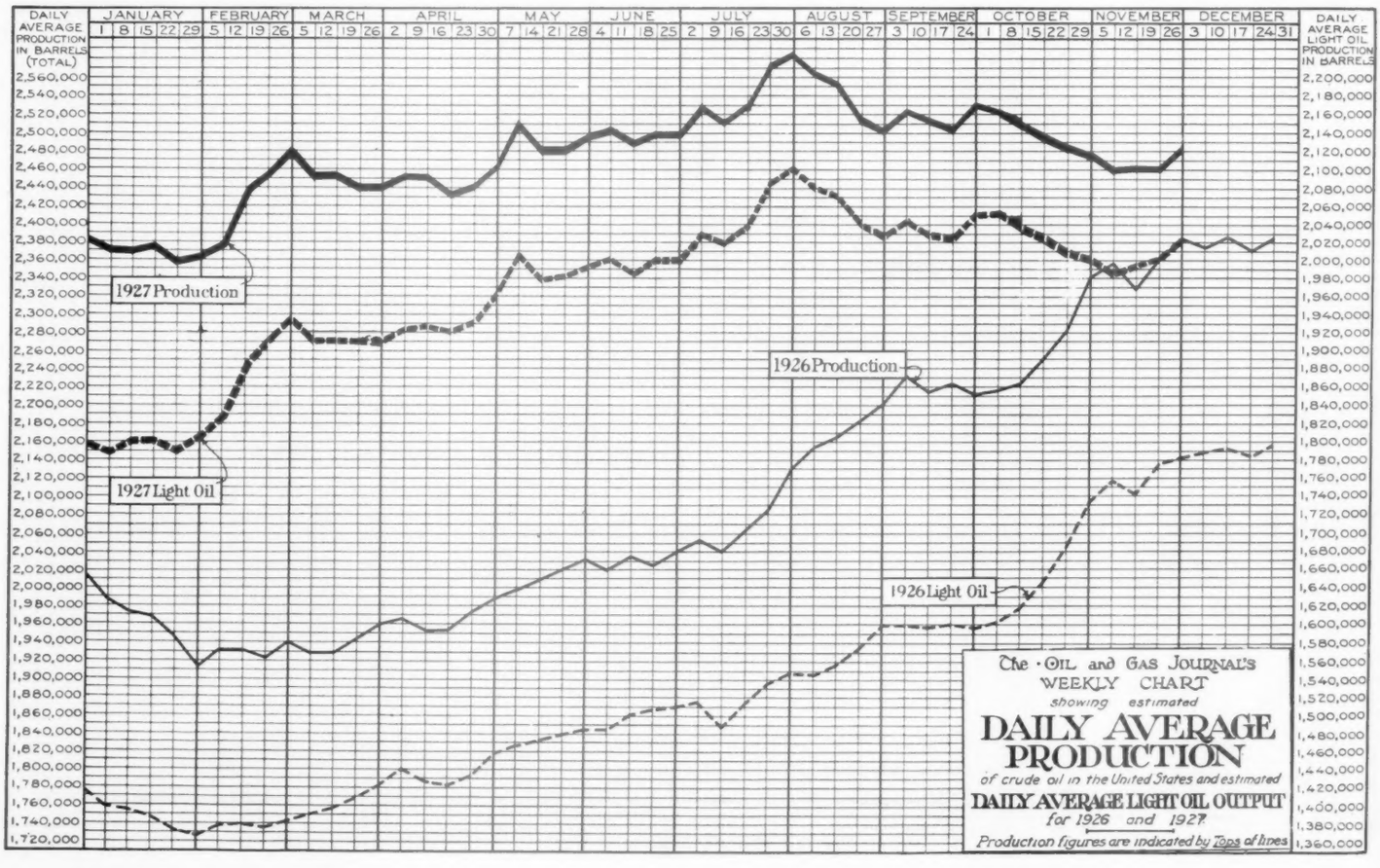
Oklahoma and Kansas operators are inclined to feel the crude oil market, at least as far as it affects the big bulk of the crude produced in these states, will strengthen after the first of the year. They base this belief on the fact high gravity crudes are expected to be in greater demand as production of the light oil fields decline. What the refiners are able to do with West Texas crude, however, will be the determining influence in the crude price structure, with the extent of overproduction in California as an important contributing factor. Much of the big production from California is expected to be crude containing a good percentage of gasoline and it can be assumed much of the excess will be shipped to Atlantic Coast ports.

PRODUCTION IN THE UNITED STATES

Estimated daily average production of light and heavy gravity oil in the United States for week ended November 26, and a comparison with the previous week follows:

	Nov. 26		Nov. 19	
	Light	Heavy	Light	Heavy
Oklahoma—				
Tonkawa	16,560	.....	16,530	.....
Burbank	37,835	.....	38,755	.....
Other Osage Fields	30,405	.....	30,420	.....
Cushing and Shamrock	21,245	.....	21,285	.....
Bristow and Eastern Bristow	24,830	.....	24,930	.....
Cromwell	10,985	.....	11,105	.....
Garber	9,910	.....	9,930	.....
Blackwell-Braman	8,960	.....	8,635	.....
Seminole	431,410	.....	422,565	.....
Wewoka	10,855	.....	11,295	.....
Northern Miscellaneous	110,345	.....	111,795	.....
Southern Fields	61,120	.....	61,050	.....
Total Oklahoma	774,460	.....	768,295	.....
North Louisiana	40,090	9,050	40,415	9,155
Arkansas	23,240	73,570	23,658	73,785
North Central Texas	140,961	.....	142,195	.....
West Texas	232,489	.....	216,918	.....
Texas Panhandle	81,695	.....	81,925	.....
East Central Texas	28,991	.....	29,076	.....
Kansas	106,210	.....	105,905	.....
Total Mid-Continent Area	1,428,136	82,620	1,408,387	82,940
Gulf Coast	.....	137,356	.....	137,322
Southwest Texas	.....	28,343	.....	28,557
Eastern	114,500	.....	114,000	.....
Rocky Mountain Area	78,163	.....	74,977	.....
California—				
Santa Fe Springs	39,000	.....	39,000	.....
Long Beach	105,500	.....	105,000	.....
Torrance	3,000	17,000	3,000	17,000
Huntington Beach	60,000	.....	59,500	.....
Dominguez	14,500	.....	14,750	.....
Rosecrans	9,000	.....	8,000	.....
Inglewood	20,000	12,000	20,000	12,000
Ventura Avenue	51,500	.....	52,000	.....
Seal Beach	48,000	.....	49,000	.....
Remainder of State	55,000	185,500	54,000	185,000
Total California	405,500	214,500	404,250	214,000
Total United States	2,026,299	462,819	2,001,614	462,819
Grand Total	2,489,118		2,264,433	

Total Increase, 24,685 Bbls.; Light Oil Increase, 24,685 Bbls.



The OIL and GAS JOURNAL

PRODUCING REFINING MARKETING

VOL. 26. NO. 28 TULSA, OKLAHOMA, DECEMBER 1, 1927

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Oklahoma Refined Prices Unchanged

Natural Gasolines and Fuel Oils Weak. U. S. Motor Gasoline Slowest of the Refinery Grades

By W. T. Ziegenhain

Oklahoma refinery prices have shown practically no change from those of last week while a fair volume of all oils was moved. Except for added weakness in natural gasoline and fuel oils the general tone is slightly better but this situation is obtained more through a determination that prices shall not go lower rather than a scarcity of any material. Refinery gasoline was moved at a good rate, the majority of it being the higher gravity, low endpoint grades, but there was plenty available and through the lack of any outside buying some refiners were forced to reduce their U. S. Motor price from 6¼ cents to 6⅛ cents. This did not alter the average price at which the bulk of the material moved compared to the previous week for the volume of the 6¼-cent gasoline had been comparatively small.

Only the normal movement of kerosene supported that market and all grades were plentiful. News of an export inquiry helped to lend confidence in the market, but no such purchase has been made to date. Furnace oil sales are now representing a good share of the total oils being moved from some refineries and although these are plentiful, that market is getting more support than any other.

Fuels and gas oils have shown added weakness as large volumes of each were offered but there was no slashing of prices to move it. Lubricants continued weak as Gulf Coast material was offered at relatively low prices throughout the normal Group 3 marketing area. Wax remained unchanged as most of the material moved to domestic consumers.

REFINED MARKET BAROMETER

The general refined oil market remained unchanged with shipments of most products being made at a fair rate. Natural gasolines and fuels in the Mid-Continent continued to be very weak and some price concessions were given. Kerosene remained at last week's prices but the demand was slow. Gas oil was weaker in the Mid-Continent but was firm along the Atlantic seaboard for much of it is being used as Diesel oil. The heavy fuels were weak in all sections except in California, where the material is being moved for export. Lubricants are weak in all sections with refiners seeking outlets in overlapping trade territories. Wax was unchanged.

Mid-Continent—Gasoline was generally weak with most of the shipments being the lower endpoint grades. Kerosene remained unchanged. Distillates moved slowly for this period of the year, but their volume was a good share of the total oil moved from some plants. Gas oils were very weak as refiners chose to decrease stocks in view of the continued weak gasoline and fuel market. Lubricants were moving into some territories at slight concessions in competition with Gulf Coast products and the future of the market is not bright over the next few weeks. Wax moved slowly and to domestic consumers only.

Atlantic Seaboard—General conditions were unchanged. Rain and warm weather partly spoiled both the gasoline and distillate market but there were no price changes. Mid-Continent gasoline arrived in a sufficient volume to weaken the retail market and this in turn depressed the refinery market but there was no change in prices. Gas oil was stronger as Diesel oil demands increased. Bunker fuel remained heavy, as a result of the continued supply of West Texas oil being refined along the coast. Venezuelan fuel is also adding to the supply of fuel along the coast and is rapidly replacing the Mexican oil. Lubricants and wax are inactive.

Pennsylvania—Gasoline was stronger but for no fundamental reason as there was plenty material available. Kerosene shared in this stronger tone but the balance of the market was unchanged.

Chicago—Most of the gasoline moved was in small lots, showing the weakness in the market. Low cold test fuels had a good support but the heavier high cold test fuels were being offered at low prices, from many refining centers.

Gulf Coast—Lower lub oil prices reflected the highly competitive conditions, while the balance of the market remained unchanged.

California—Gasoline stocks increased over the month but prices remained firm. Fuels were strong with much of the material moving for export. There was no change in the other products.

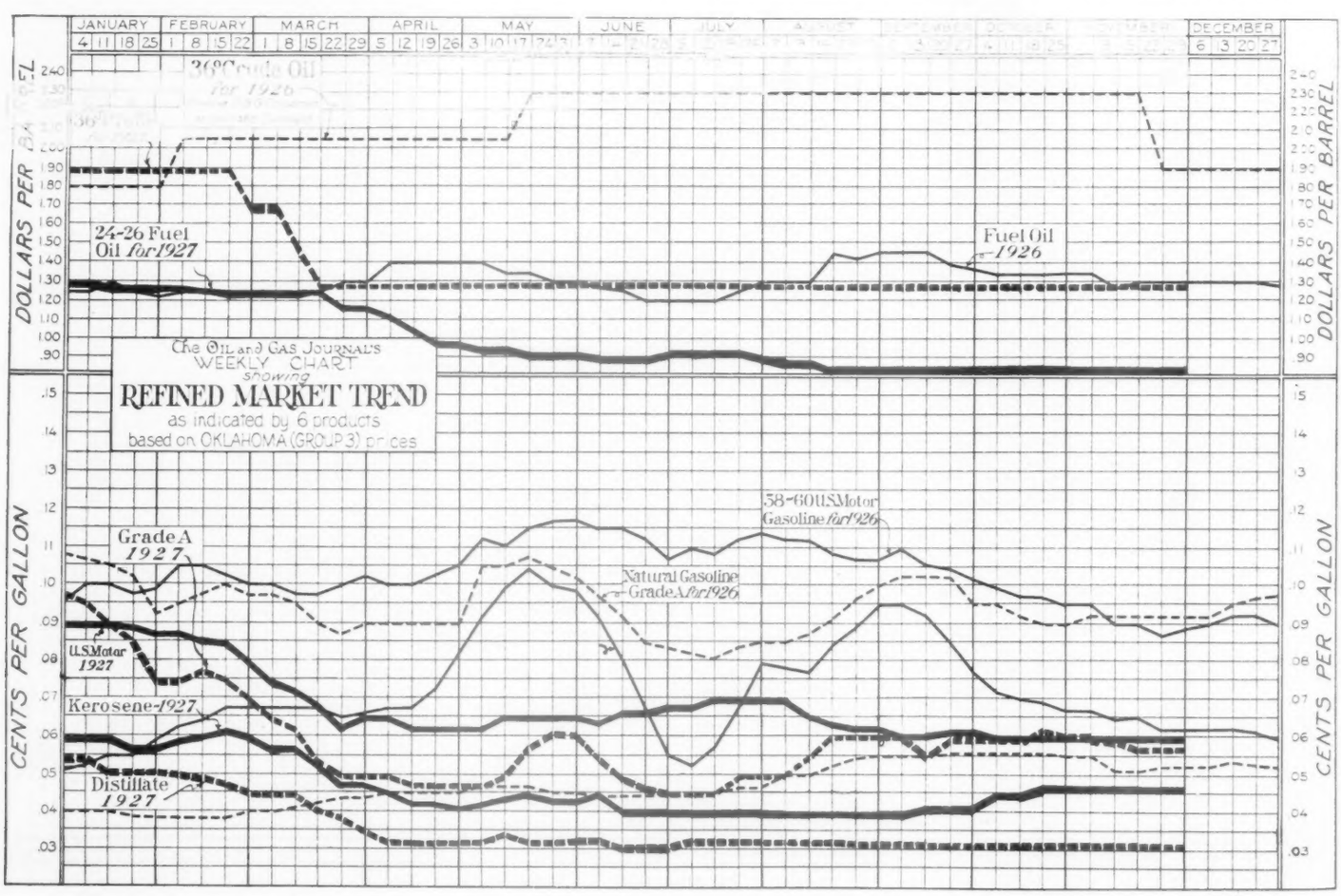
With the continuation of very mild weather throughout the normal Group 3 marketing territory gasoline consumption has been maintained at a good rate. Although the temperature has not gone below freezing, marketers have ordered out the more volatile grades. These low endpoint grades have been selling at such a small differential above the U. S. Motor grade marketers have preferred to pay the difference. This small differential has been made possible by better fractionation and while gasoline prices in general are low and natural gasoline prices remain below the U. S. Motor refinery price, it is possible to make a large share of the refinery production into the low endpoint grades, even at this low differential in price.

Naturals Weak

But this demand for the higher gravity gasolines did not prove sufficient to strengthen the natural gasoline market and large volumes of the cheaper grades were offered. The A grade was scarce and took a premium above the other grades while the C grade was being freely offered at the general market with some manufacturers willing to make price concessions. This condition has been brought about by the increased production in the Seminole Field and the cooler weather. At this high rate of production the future of that market is problematical, for even substantial purchases for export do not seem to give it sufficient strength to maintain its price on a par with U. S. Motor refinery gasoline.

Some manufacturers feel the volume of these exports will materially increase over the next few months, pointing to the low stocks of gasoline being carried on the Gulf for delivery out of there.

(Continued on Page 284)



Reserves of Nation Ample for Future

Noted California Geologist Believes There Are Now More Than a Hundred Years' Supply of Petroleum Left

By J. E. Eaton
Consulting Geologist.

During the past 10 years we have been told so many times that our supply of oil is about to be exhausted that some of us have believed this assertion without trying to figure out whether it is true or not. Recent progress in geology and chemistry has shown that our visible supplies of oil are rapidly increasing rather than decreasing, as a result of progress in the sciences, and most technicians have now stopped predicting an untimely exhaustion of oils.

The public, however, has been informed so often during the years that our supply of oil will soon be exhausted that it has come to believe this, all oblivious to the advance of science. As long as the price of gasoline remains absurdly low, the fears of the public will be kept partly in the background. Let oil production slacken for a year, let gasoline rise 10 cents a gallon, and we may expect to see one of the biggest popular explosions in our industrial history. I am going to speak plainly in this article. The time has come to do this.

Public Opinion

The oil industry is at present confronted with the question of government control, and this question seem likely to come up in the current Congress. I call attention to two facts: (1) Public opinion controls, on the whole, the policies of Congress; and (2) the public believes that our oils will soon be exhausted. With all due respect to our present efforts to obtain equitable legislation, it seems to me that the oil industry is bailing out the water without stopping up the hole. The uneasiness in Congress is an effect. The cause of that uneasiness is fear on the part of the public of oil exhaustion, fanned by sensational newspaper reports. These fears may seem unwarranted to those connected with the oil industry, but they are very real to the public.

Ponder this feature: The oil industry is attacked not only when production goes down, but also when it goes up. This does not show reason, but hysteria. The present agitation comes at a time when production is ample, when gasoline is dirt cheap, and when vast new reserves of oil are appearing on the horizon. There is food for thought in this condition.

The oil industry appears to be placing too much dependence on temporary legislation, and too little on the public state of mind. In a jury trial, the court presides, but the jury decides the case. Congress is in effect a court, the public a jury. Let the oil industry make no mistake; it may present its case through Congress, but it pleads that case before the people of the United States. The chief witness against the oil industry will be fear of oil exhaustion. The industry must discredit this witness, or its case will eventually be lost.

Estimates Too Low

I have inferred that past estimates of our oil reserves have been too low, and must now defend my position. The attached graph of California production since the year 1914 illustrates the point I am asking.

In examining this graph, note that by the close of 1928 California will have produced more oil than the entire supply visible in 1915 (13 years earlier). Also note that before the close of 1930 it is indicated that California will have produced more oil than the entire supply visible in 1923 (seven years earlier). Note that the trend of estimates, both proven and prospective, has been upward during the years. Even the estimates of 1926, made one year since, are indicated by recent discoveries to be too low.

The graph tells only a part of the tale. It shows the increased production starting in 1923 when central Los Angeles Basin flooded the world with oil, but it cannot show the potential production of central San Joaquin Basin. This latter area is theoretically favorable for enormous productions, is three times as large as all Los Angeles Basin, and is practically untested. The older estimates of proven production shown were accurate for their time. It is new and undreamed of discoveries in wildcat areas that have caused the estimates to jump—and will probably keep them jumping for many years.

New Discoveries

California oil does not appear to be anywhere near exhausted. The state produced, or will have produced, around 1,326,000,000 bbls. of petroleum in the six-year period between 1921 and 1928. And yet, in spite of this tremendous yield, the rising estimates of proven production necessitated by new discoveries have left the visible reserves almost undiminished. I refuse, at this time, to estimate the total ultimate production of California. My last estimate, considered high when it was made, was indicated within a year to be 500,000,000 bbls. low.

I will let the geologists of other states speak for themselves, but will venture the opinion that geologists in Oklahoma, Texas and Arkansas will find that recent discoveries in those districts have made inadequate the production estimates of but a few years back.

Assuming, for the sake of argument, that the oil supply of the nation derived from wells will be exhausted in 20 years (and I do not believe this for a moment), let us consider possible foreign reserves. When exhaustion of our own wells occurs, there appears to be a 10 or 20-year supply of oils from the northern part of South America. This latter reserve is in large part owned by our citizens, and requires a shorter haul by sea from New York than do our California oils. We are in so little need of petroleum, and prices are so cheap, that this great reserve has to date been only partly outlined.

Enormous Reserves

We pass on to our synthetic reserves. We have all heard of our oil-shales, which, according to some technicians, have a total oil content greater than our entire supply from wells. I will not attempt to estimate this resource; it is too vast to more than approximate, but I cite it against those who preach catastrophe.

But perhaps you do not consider that the foregoing resources, aggregating more than a 100 years' supply of oils, are sufficient. Then I will cite our lignites and our low-grade coals. The two largest oil companies in the world have, according to reports, thought enough of a method of distilling oil from this source to recently acquire patents covering such distillation. The ultimate perfecting of this or a like method appears almost inevitable. Once admit that oil can be commercially produced from lignite and low-grade coal, and you admit that our oil supply is assured for hundreds of years.

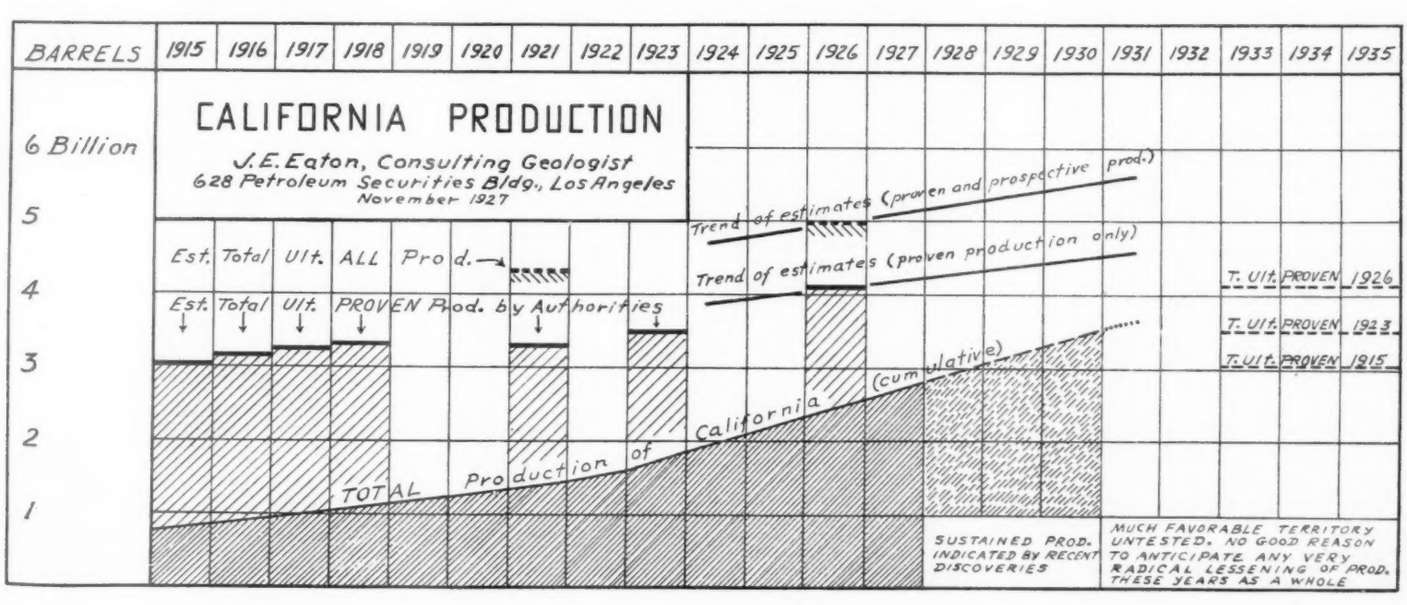
I do not remember that any of our great staples have had an untimely exhaustion, but I do recollect that persons have predicted such exhaustion. Gasoline displaced the horse a few short years ago. How long, at the dizzy pace of science, before a better power will displace gasoline? This we cannot say, but I have every confidence that it will be before our last great reserve of gasoline is gone.

Some years ago it was the fad for newspapers to create sensations out of a view of scientists that our supply of air, water, and heat may eventually diminish to such an extent that the earth will become uninhabitable., There is some reason to hold this view geologically, but we know that there has been very little average change during past geologic time, and few geologists expect that air, heat, or water will be exhausted in the next 500,000,000 years or so. And yet I was once consulted by a dear old lady, who came to me all in a flutter. She had seen a newspaper cartoon which pictured human beings dying on a freezing, airless, waterless earth; and, poor things, she could not sleep for the thought of it. To this day, whenever I read a newspaper caption such as: Experts say oil will be exhausted in 20 years, I think of that nice old lady.

Furnish the Facts

The public has seen the story of untimely oil exhaustion repeated in newspaper headlines for so many years that it has come to believe that it is true. It accepts this nightmare as fact. We have been singularly blind. We have assured the public that the oil industry is capable of handling the general situation, and in the same breath we have led the public to believe that our oil is being wasted and will be exhausted in a few years. The man in the street cannot reconcile these features—and, for that matter, neither can I.

In closing I would emphasize my opinion that we are not giving sufficient attention to a great underlying cause of discord—the belief ingrained in the public that a castrophe impends. The oil industry can, and should, rouse the public from its nightmare. Let facts be furnished which will banish its fears.



Institute's Meeting at Critical Time

Committee of Nine and Congress Also Scheduled to Take Up Oil Conservation Program During Present Month

By N. O. Fanning

New York Bureau, The Oil and Gas Journal, Room 629, No. 101 Park Avenue, New York, N. Y.

NEW YORK, Nov. 28.—December will be of outstanding importance to the petroleum industry. The annual meeting of the American Petroleum Institute will be held in Chicago on December 5, 6, 7 and 8. The Committee of Nine, appointed at the instance of Secretary of the Interior Hubert C. Work for the consideration of legislative needs of the petroleum industry will meet in Washington on December 10 and the complete roster of the committee will then be announced. This committee will have three members representing the American Petroleum Institute, three representing the Government and three representing the American Bar Association. On December 8, the directors of the American Petroleum Institute meet and will probably take some important action on conservation. On December 5 the Congress of the United States opens a session which is expected to be momentous in the annals of the oil industry.

Conservation of oil, the leading problem before the petroleum industry, will be the leading topic of discussion at all these meetings.

Conservation Committees

At the annual meeting of the American Petroleum Institute in Tulsa, December, 1926, the board of directors discussed the preliminary report of the Federal Oil Conservation Board and adopted two resolutions in line with the Federal Board's conservation recommendations. One held that prevention of waste of gas is of paramount importance in the conservation and economical production of oil and the other approved in principle agreement by operators having for their purpose the economical and orderly production of oil, and two committees were appointed to make the necessary studies. The resolutions and the personnel of the committees follow:

"Resolved, that the president of the institute appoint a committee of seven to formulate and recommend to this board or its executive committee at the earliest practicable date a program of legislation, Federal and state, to be advocated by the institute giving sanction and effect to agreements by oil producers for the curtailment of production in pools where and during periods when there is overproduction, having for their purpose the economical and orderly production of oil."

The committee on agreements is comprised of the following: Amos L. Beaty, The Texas Corporation, chairman; James A. Veasey, Carter Oil Co.; C. B. Ames, Oklahoma City, Okla.; John C. Townes, Humble Oil & Refining Co.; A. L. Weil, General Petroleum Corp.; Axtell J. Byles, Tide Water Oil Co., and F. C. Proctor, Houston, Tex.

"Resolved, that we endorse the conclusion of the Federal Oil Conservation Board in its report of September, 1926, that the prevention of the waste of gas incident to the production of oil is of paramount importance in the conservation and economical production of oil, and the president of the institute is requested to appoint a committee of seven to devise and suggest to this board or the executive committee such measures as will enable the industry, while continuing to meet the consumption requirements for petroleum and its products, to conserve in its natural state such reserves of petroleum as may not then be required for consumption."

The following were appointed as members of the Committee on the Prevention of the Waste of Oil: E. W. Marland, Marland Oil Co., chairman; Sid Keoughan, Continental Oil Co.; Henry McGraw, Gypsy Oil Co.; W. S. Farish, Humble Oil & Refining Co.; J. Edgar Pew, Sun Oil Co.; L. P. St. Clair, Union Oil Co. of California; Thomas A. O'Donnell, California Petroleum Co.

Prevention of Gas Waste

The Committee on the Prevention of the Waste of Gas has made an exhaustive study of the function of gas in oil production. A technical subcommittee recently presented its preliminary summary after comprehensive study of a mass of data collected. It was the conclusion of all committees that the conservation of gas in the production of oil is of paramount importance.

Respecting the best means for the most efficient utilization of gas the committee said: "Oil should be produced in such a way as to retail in the sand the maximum percentage of the original gas energy. Repressuring cannot reproduce original conditions, as evidenced by laboratory results in the field. Data presented indicate no one method of producing wells is equally applicable to all fields or to all wells on the same field, or even to adjoining wells in the same lease, or to all periods in the life of the same well. The conservation of gas in flowing and pumping wells is a problem for individual study and field tests for which no one rule or set of rules can be prepared. Proper conservation of gas in the production of oil should, therefore, be assigned to the petroleum engineer to solve by analysis and experimentation.

The committee stated that the advantages in gas untilization of an ideal cooperative development of an oil pool as compared to typical nonco-operative competitive drainage practice were as follows:

1. Permits most efficient application of methods to conserve and utilize gas and therefore permits greater ultimate recovery.

2. Permits more satisfactory spacing and distribution of wells.

The committee on the Prevention of Waste and Gas will render a report at the meeting of the institute in Chicago covering a comprehensive study of conservation problems.

Accounting, Research Problems

The Committee on Uniform Methods of Accounting will have ready for presentation all the detail of revenue and expese accounts and the published income statement will be considered for final approval. A uniform balance sheet was approved last year and at least 10 major companies have adopted it.

There will be a session on fundamental research devoted to a discussion of the research project now being prosecuted, with particular reference to establishing a closer co-operation between petroleum technologists and the research fellows.

A feature of the session on motor fuels will be a report of the co-operative motor fuel research during the past year at the United States Bureau of Standards, sponsored by the bureau, the National Automobile Chamber of Commerce, the Society of Automotive Engineers and the American Petroleum Institute. This report comprises three sections, one dealing with the relationship between the starting quality of motor fuel and the usual laboratory distillation test; the second, with the properties of motor fuel that are important from the standpoint of quick acceleration, and the third with the results of a survey of present-day motor fuels to determine their antiknock rating.

PROGRAM EIGHTH ANNUAL MEETING, AMERICAN PETROLEUM INSTITUTE, DECEMBER 5, 6, 7, 8, 1927, STEVENS HOTEL, CHICAGO

The American Petroleum Institute makes the following announcement of the revised program in connection with its eighth annual meeting to be held at the Stevens Hotel, Chicago.

Committee Meetings.

Immediately preceding or during the eighth annual meeting the following named committees will meet at the Stevens Hotel.

Friday, December 2

(and until work is completed.)

10:00 a. m. Committee on Gas Conservation. (Private Dining Room 3.)
10:00 a. m. Committee on Uniform Methods of Oil Accounting. (Private Dining Room 5.)

Monday, December 5

Standardization Committees.

10:00 a. m. Committee on Standardization of Oil Steel Storage and Production Tanks. (Room 422-A.)
10:00 a. m. Committee on Standardization of Specifications for Steel and Iron Pipe for Oil Country Tubular Goods. (Room 423-A.)
10:00 a. m. Committee on Standardization of Standard Rigs and Derricks. (Room 430-A.)
10:00 a. m. Committee on Standardization of Bolted Tanks. (Room 435-A.)
10:00 a. m. Committee on Standardization of Wire Rope and Manila Cordage. (Room 439-A.)
10:00 a. m. Committee on Standardization of Belting. (Room 440-A.)
10:00 a. m. Committee on Standardization of Pumping Equipment and Engines. (Room 444-A.)
10:00 a. m. Committee on Standardization of Rotary Drilling Equipment. (Room 445-A.)
10:00 a. m. Committee on Standardization of Oil Field Boilers. (Room 450-A.)
10:00 a. m. Committee on Standardization of Rig Irons. (Room 451-A.)
10:00 a. m. Committee on Standardization of Cable Tool Joints. (Room 452-A.)

Other Committees.

9:30 a. m. Committee D-2 on Petroleum Products and Lubricants. (A. S. T. M.) (West Ball Room.)
10:30 a. m. Committee on Railroad Transportation and Mechanical Subcommittee. (Private Dining Room 4.)
10:30 a. m. Committee on Oil Pollution. (Private Dining Room 9.)
2:00 p. m. Committee on Fire Prevention. (West Ball Room.)
8:00 p. m. Committee on Automotive Transportation. (Private Dining Room 4.)

Note—The following committees will meet at the time and place indicated to committee members by the chairman of each committee:

Committe on Public Relations.
Committee on Vapor Pressure.
Committee on Tank Car Calibration.

Directors' Meeting.

10:30 a. m. Meeting of board of directors. (Private Dining Room 1.)
Luncheon for members of the board at noon. (Private Dining Room 2.)

Tuesday, December 6

Morning.

10:30 a. m. Meeting of the board of councillors. (North Ball Room.) To nominate candidates for election as members of the board of directors.

Afternoon.

2:30 p. m. General session. (Grand Ball Room.)
The president's address: E. W. Clark.
Report of the board of councillors.
Election of directors.
The Story of Petroleum: First showing of the six-reel motion picture film produced under the direction of the United States Bureau of Mines in co-operation with the American Petroleum Institute.

Wednesday, December 7

Note—There will be no general session on Wednesday. The morning, afternoon and evening will be devoted to group meetings, arranged by general topics, at which the various subjects will be treated in addresses and papers by selected speakers. Opportunity will be given for brief general discussion of the subject after each speaker has finished.

Morning.

10:30 a. m. Meeting of new board of directors. (Private Dining Room 1.)
Luncheon for members of the board at noon. (Private Dining Room 2.)
10:00 a. m. Group meetings:

Group 1—General topic: Motor Fuel. (North Ball Room.)
Report on co-operative motor fuel research at the United States Bureau of Standards during the current year:
"An Interpretation of A. S. T. M. Distillation Test for Motor Fuel," O. C. Bridgeman and C. S. Cragoe.
"Some Factors in Engine Acceleration," R. Best and J. O. Eisinger.
"A Detonation Survey," H. K. Cummings.
"A Comparison of Methods of Measuring the Knock Characteristics of Fuels," Dr. Graham Edgar, Ethyl Gasoline Corp.
General discussion.

Group 2—General topic: Standardized Oil Field Equipment. (Grand Ball Room.)
Condensed reports of the following standardization committees:
Committee on Belting for Oil Country Use.
Committee on Oil Field Boilers.
Committee on Rig Irons.
Committee on Standard Rigs and Derricks.
Committee on Wire Rope and Manila Cordage.
Special papers:
"Some Advantages of Standardized Rigs and Derricks and Rig Irons," C. D. Watson, Carter Oil Co. (Illustrated with slides.)
"A. P. I. Belting," F. O. Prior, Midwest Refining Co. (Illustrated with slides.)

"The 'Why' A. P. I. Standard Boilers," R. G. Hamaker, Humble Oil & Refining Co. (Illustrated with slides.)
General discussion.

Note—The sessions on standardization this year will be of special interest to field superintendents, etc., and will be confined principally to the advantages and the results gained from the use of A. P. I. standards.

Group 3—General topic: Oil Accounting. (West Ball Room.)
Report of Committee on Uniform Methods of Accounting, M. W. Mattison, chairman.
General discussion of report.
"Co-operation Between Executives and Comptrollers," Prof. Roy Kester, Columbia University.
"Machine Handling of Accounts Payable," George H. Forster, Union Oil Co. of California.
General discussion.

Group 4—General topic: Transportation. (South Ball Room.)
Railroad:
"Testing Tank Car Valves," D. V. Stroop, United States Bureau of Standards.
"Uniformity in Industrial Side Track Agreements," J. C. Irwin, Committee XX of American Railway Engineering Association.
General discussion.
Automobile Truck:
"Handling Motor Truck Equipment," Roy F. Fike, Mid-Continent Petroleum Corp.
"Motor Vehicle Transportation," J. F. Winchester, Standard Oil Co. of New Jersey.
General discussion.

Afternoon

2:00 p. m. Group meetings:

Group 1—General topic: Refinery Technology. (North Ball Room.)
"Pipe Still Distillation," A. G. Peterkin, Jr., The Atlantic Refining Co.
"Recovery of Acid from Sludge," W. N. Davis, Standard Oil Co. of California.
"Vacuum Distillation," Frank A. Howard, Standard Development Co.
"Some Facts Concerning Vapor Phase Cracking," Luis de Florez, consulting engineer.
"Improved Method of Treating Cracked Naphtha," Ralph A. Halloran, Standard Oil Co. of California.
"Strength of Steel at Elevated Temperatures with Particular Reference to Safety Factor," T. McLean Jasper, A. O. Smith Corp.
General discussion

Group 2—General topic: Development and Production Engineering. (Grand Ball Room.)
"Value of Gas in the Conservation of Oil," Dr. W. P. Haseman, Marland Oil Co.
"Portland Cement for Shutting Off Water in Oil Wells," J. F. Hough, Portland Cement Association. (Illustrated with slides.)
"The Advent and Place of the Development and Production Engineer in the Oil Industry," A. C. Rubel, Union Oil Co. of California.
General discussion.

Group 3—General topic: Oil Accounting. (West Ball Room.)
"Realization Methods in Refining Costs," M. A. Chambers, Panhandle Refining Co.
"Gasoline Taxes in Accounting," George F. Smith, Continental Oil Co.
"I. C. C. Classification of Pipe Line Accounts," Ralph Hare, Prairie Pipe Line Co.
"Problems of Oil Refining Costs," R. D. Matthews, Union Oil Co. of California.
General discussion.

Group 4—General topic: Fire Prevention and Safety. (South Ball Room.)
"Successful Methods of Plant Protection from Fire," C. J. Cutting, The Atlantic Refining Co.
"Static—What It Is and How It Is Produced" (with experiments), Dr. J. Barton Hoag, University of Chicago.
"Fire Laws for the Oil Industry," Frank A. Epps, Tide Water Oil Co.
"The Industrial Safety Problem," W. H. Cameron, National Safety Council.
"Preventing Accidents in the Petroleum Industry," H. N. Blakeslee, Petroleum Section, National Safety Council.

Evening.

8:00 p. m. Group meetings:

Group 1—General topic: Refinery Technology. (North Ball Room.)
The meeting will be devoted to a general discussion of problems of refinery technology.
Note—If the board of directors authorizes the creation of a Division of Refinery Technology, as recommended by the Committee on Technical Relationships, the members of the institute present will elect the officers of the division for the year 1928 and discuss plans of activity for the division, including the organization of geographical sections.

Group 2—General topic: Development and Production Engineering. (Grand Ball Room.)
The meeting will be devoted to a general discussion of problems of development and production engineering.
Note—If the board of directors authorizes the creation of a Division of Production Engineering, as recommended by the Committee on Technical Relationships, the members of the institute present will elect the officers of the division for the year 1928 and discuss plans of activity for the division, including the organization of geographical sections.

Group 3—General topic: Oil Accounting. (West Ball Room.)
The meeting will be devoted to a general discussion of problems of oil accounting.
Note—If the board of directors authorizes the creation of a Division of Oil Accounting, as recommended by the Committee on Uniform Methods of Oil Accounting, the members of the institute present will elect the officers of the division for the year 1928 and discuss plans of activity for the division, including the organizaton of geographical sections.

Thursday, December 8

Note—Thursday morning and afternoon will be devoted to group sessions, arranged by general topics, at which the various subjects first will be treated in addresses and papers by selected speakers. After each speaker has finished, opportunity will be given for discussion of the subject.

Morning.

10:30 a. m. Meeting of board of directors. (Private Dining Room 1.)
Luncheon for members of the board at noon. (Private dining room 2.)

10:00 a. m. Group meetings.

Group 1—General topic: Natural Gasoline. (North Ball Room.)
Note—The Natural Gasoline Association of America has arranged the program for and is co-operating with the institute in the holding of this group session.
"Economics of the Natural Gasoline Industry," Dr. E. R. Lederer, Texas Pacific Coal & Oil Co.
"Vapor Pressures of Natural Gasoline," G. G. Oberfell, Phillips Petroleum Co.
"Natural Gasoline as a Chemical Material," Emby Kaye, Skelly Oil Co.
General discussion.

Group 2—General topic: Standardized Oil Field Equipment. (South Ball Room.)
Condensed reports of the following standardization committees:
Committee on Cable Drilling Tool Joints.
Committee on Rotary Drilling Equipment.
Committee on Oil Country Tubular Goods.
Committee on Pumping Equipment and Engines.
Committee on Steel Storage Tanks.
Special papers:
"Results of Usage and Advantage of Standard A. P. I. Taper Joints for Rotary and Cable Tool Drilling," R. A. Wilson, Guiberson Corp. (Illustrated with slides.)
"Purchasing A. P. I. Standardized Material," R. M. Ketchum, General Petroleum Corp.
"Advantages and Results of Experiences in the Use of A. P. I. Standards on Pumping Equipment, i. e., Tubing, Working Barrels and Parts, Sucker Rods, etc.," T. E. Swigart, Shell Co. of California. (Illustrated with slides.)
"Evaluating Wire Rope Life." (Speaker to be announced.)
General discussion.

Group 3—General topic: Taxation—Federal, State and Municipal. (West Ball Room.)
"Federal Taxation," A. W. Gregg, former assistant to the Secretary of the Treasury.
"State and Municipal Taxation," Frank E. Packard, Standard Oil Co. of Indiana.
General discussion of problems of taxation.

Group 4—General topic: Corrosion of Oil Industry Equipment. (Grand Ball Room.)
"Corrosion in Refinery Equipment," Gustav Egloff, Universal Oil Products Co.
"Refinery Corrosion Problems," Brian Mead and Stewart Coleman, Humble Oil & Refining Co.
General discussion of refinery corrosion problems.
"Report of A. P. I. Temporary Committee on Corrosion and Digest of Questionnaire Issued by Committee," F. N. Speller, chairman, National Tube Co.
General discussion.

Afternoon.

2:00 p. m. Group meetings.

Group 1—General topic: Marketing Petroleum Products. (North Ball Room.)
"What Price Free Equipment?" B. H. Anglin, Indian Refining Co.
"Credit," John D. Gill, The Atlantic Refining Co.
"Fields for Increased Consumption of Petroleum Products, Automatic House Heating, etc.," Harry D. Freuauff, Henry L. Doherty & Co.
"Double Standards," L. V. Nicholas, Independent Oil Men of America.
General discussion of marketing problems.

Group 2—General topic: Fundamental Research in Petroleum. (West Ball Room.)
Note—This group meeting will be devoted to a general discussion of the institute's program of fundamental research in petroleum physics, chemistry and geology financed through funds donated by John D. Rockefeller and the Universal Oil Products Co.
Brief talks will be made by three members of the Central Petroleum Committee of the National Research Council, to wit:
Dr. H. S. Taylor, professor of physical chemistry at Princeton University and chairman of the Central Petroleum Committee;
Dr. Frank C. Whitmore, professor of chemistry at Northwestern University and chairman of the Division of Chemistry and Chemical Technology, National Research Council; and
E. DeGolyer, Amerada Petroleum Corp., and member Committee on Studies in Petroleum Geology of the National Research Council.
Following these talks, it is expected that those interested in this general topic will participate in a round table discussion with especial reference to co-operation between technical men of oil industry and the research fellows.

Group 3—General topic: Regulation—Federal, State and Municipal. (South Ball Room.)
"Federal Regulations," T. K. Schumuck, The Texas Company.
"State and Municipal Regulations" (two papers), W. T. Holliday, Standard Oil Co. of Ohio; Edwin S. Hall, Standard Oil Co. of New Jersey.
General discussion of problems of regulation.

Group 4—General topic: Corrosion of Oil Industry Equipment. (Grand Ball Room.)
"Corrosion of Tankers and Marine Equipment," Oliver Duke, Sun Oil Co.
"Pipe Line Corrosion," A. S. Jones, Associated Pipe Line Co.
"Reconditioning of Pipe Lines" (a motion picture film).
"Requirements of Good Protective Coatings," W. H. T. Thornhill, Wailes Dove-Hermiston Corp.
General discussion pipe line protection.
General discussion of corrosion of oil well equipment.

Note—The institute's Temporary Committee on Corrosion will arrange an exhibit of protective coatings for equipment which will be shown to those interested in the subject of corrosion in the Writing Room, second floor, Stevens Hotel.

Evening.

8:00 p. m. Annual dinner. (Grand Ball Room.)
Playlet: "So's Your Oil Man," California Wildcats.

Special Notice

As a courtesy to the National Tube Co., we announce its invitation to all members of the institute attending the Chicago meeting to visit its Gary plant on Friday, December 9, the day after adjournment of the institute meeting.

Gas Big Factor in Texas Panhandle

Ultimate Production of Crude Oil Per Acre Can Be Increased Quite Materially If Natural Gas Is Conserved

By C. Max Bauer*
Chief Geologist, Midwest Exploration Co.

The importance of the conservation of gas in the Texas Panhandle can hardly be overestimated. It affects the oil producer nearly as much as it does the gas producer. The fact that the granite wash and dolomite are in communication and that the oil and gas reservoirs are thus connected means that whatever affects the gas will affect the oil.

In the following paper it is shown that the amount of gas produced at the present time in the Panhandle will deplete the field in 24 years. It is also shown that more than half the gas produced is wasted. If the wastage could be stopped the life of the field might be doubled or even trebled. This would be beneficial to oil and gas operators alike. From recent studies made by John R. Evans we find that where the gas has been allowed to blow off the pressure has declined very rapidly and the ultimate production per acre will not exceed 6,000 bbls. whereas if the gas is saved the initial production per well may not be as great, the ultimate production of oil will exceed 8,000 bbls. per acre. It seems clear that by saving the gas in a given locality the oil production may be greatly increased and the cost of cementing an extra string of pipe is not significant compared with the additional recovery of oil obtained by saving the gas.

The discovery of gas in the Texas Panhandle which led to the discovery of oil was due to the efforts of S. F. Sullenberger, Frank Stone, M. C. Nobles, Doctor Cunningham, and G. H. Gainer, who formed the Amarillo Oil Co. early in 1918 and upon the geological advice of Dr. Charles N. Gould drilled No. 1 Masterson which encountered gas in December of 1918. Up to that time no deep holes had been drilled in the Panhandle nearer than the well at the town of Spur in Dickens County. The Empire Gas & Fuel Co. were drilling a well in Cimarron County, Oklahoma, about half way between the town of Elkhart, Kans. and Boise City, Okla. This well was never drilled more than 1,583 feet. From all indications of the structure as worked out from western Oklahoma it appeared that the Panhandle was underlain with a great thickness of red beds. It will be remembered that the so-called "big lime" of the Panhandle does not outcrop in Oklahoma[1]; that is, in going eastward the "big lime" grades into shale and at the outcrop it consists of red beds, hence any prospecting which was carried on in the Panhandle at that time lacked information on the character of the strata at depth—the red beds were considered unfavorable and the Pensylvanian thought to be too deep. Then, too, much of the area was covered with Tertiary which concealed the structure of the Permian. Structures were known along the Canadian River where the Permian was exposed and had been mapped as early as 1905 by Doctor Gould and a party from the United States Geological Survey[2].

Gas Brought Oil Companies

The discovery of gas in large quantities attracted the attention of many of the oil companies to the Panhandle. As drilling proceeded, arkose and granite were encountered in northern Potter and northern Carson Counties. This immediately aroused the interest of the geologists to explain the character of the structure and the trend of production. The nearest granite exposed was in the Wichita Mountains; hence, the first supposition was that the granite of the Panhandle was merely a buried ridge or extension of the Wichita Mountains of Oklahoma. This was disputed by several geologists who attempted to show that the granite in Potter County was an intrusion of Permian age or later, however, accumulated evidence has shown that the granite found in Potter and Carson Counties must be attributed to the presence of a chain of mountains which became islands in early Permian time and were then deeply buried by sediments of Permian and Triassic age.

The supposition of the geologists that the Potter County Dome was connected with the Wichita Mountains enlarged the prospective territory greatly and drilling along a line between the two areas began in the spring of 1919 with a result that much gas was found but oil was not discovered until the spring of 1921.

Character of the Gas

The gas first discovered and developed along the Panhandle anticline was lacking in gasoline or any of the hydrocarbons which might be used for natural gasoline. In other words, it was known as a dry gas. It was higher in ethane than usual and several streaks of gas were encountered which were known as poison gas. With the development of oil in Carson and Hutchinson Counties it was found that the gas associated with the oil contained considerable gasoline and also that the poison gas was much more plentiful in that area than it was along the axis of the major structure. The poison gas is due to hydrogen sulphide. Since the manufacture of natural gasoline began many analyses of the gas have been made with the result that helium has been found at several places in considerable quantity. The gas in central Potter County is especially high in helium content and I am told that the western extension of the gas field into Hartley County contains considerable helium. It is also interesting to note that a well drilled about 6 miles west of Adrian in Oldham County encountered considerable gas in five different strata between 1,500 and 2,000 feet in depth and as it did not burn it was called "air" by the drillers. The following is a typical analysis of the gas:

	Per cent
Methane	68.7
Ethane	17.5
Carbon dioxide	.7
Oxygen	.4
Hydrogen Sulphide	3.0
Nitrogen	9.7
Heating value	987 B.t.u.

Size of the Field

The accompanying map shows in outline the area underlain by gas in commercial quantities; that is, the outline is drawn to enclose only wells of 10,000,000 cubic feet daily capacity. There are gas wells of smaller size out side of this area but it is believed that the average of wells inside of this area will be well over 10,000,000 cubic feet capacity. The size of the area of productive gas in the Panhandle as outlined on this map is 1,483 square miles or 949,120 acres. This divided into counties is as follows: Hartley 24.8 square miles, Moore 447.1 square miles, Potter 183.0 square miles, Hutchinson 197.8 square miles, Carson 295.5 square miles, Gray 193.0 square miles, Wheeler 138.5 square miles, Collingsworth 3.3 square miles.

By checking over a large number of driller's logs we find that the average thickness of the gas pay in the Texas Panhandle is 36.2 feet. This figure agrees fairly well with a study of the samples which we have been able to secure from some of the wells although as far as the samples go it may be said that there is some porosity in the dolomite which is not reported as pay sand by the drillers. In other words, the portion of the dolomite which is sufficiently porous to produce gas is at least 36 feet in thickness although this occurs in from three to seven pay streaks. The following is an estimate by Fred Roth of the thickness of the gas pay and of the dolomite in the Texas Panhandle by counties:

(1) Thickness of the Gas Pay Based on the Drillers' Logs and the Scout Reports

County—	Number wells	Total pay (feet)	Average thickness (feet)
Carson	39	1,704	43.7
Gray	36	907	25.2
Hutchinson	40	1,403	35.0
Moore	10	403	40.3
Potter	17	675	39.7
Wheeler	32	1,311	40.8
Total	174	6,403	
Average pay per well		36.2	

(2) Thickness of the Dolomite Series as Based on Data From the Sample and Drillers' Logs

County—	Feet
Carson	420
Gray	240
Hutchinson	420
Moore	180
Potter:	
(a)	*150
(b)	†200
Wheeler	165

*Gas from true sands above and below dolomite.
†Gas field near gentry.

Original Gas Content

The total area of gas in the Panhandle amounts to 1,483 square miles or 949,120 acres. Tabulated by counties the data is given below:

County—	Thickness of gas pay (feet)	Square miles	Amount
Moore	40.3	447.1	50,187,000,000
Hartley	40.0	24.8	2,765,000,000
Potter	39.7	183.0	20,254,000,000
Hutchinson	35.0	197.8	19,498,00,0000
Carson	43.7	295.5	36,000,000,000
Gray	25.2	193.0	13,559,000,000
Wheeler	41.0	138.5	15,830,000,000
Collingsworth	40.0	3.3	368,000,000

The average thickness of pay is 36.2 feet and the total recoverable gas in the Panhandle before drilling began is estimated at 158,461,000,000 cubic feet at 430 pounds pressure. A small area in central Potter County shows 750 pounds pressure. At one atmosphere pressure the amount is 4,436,000,000,000 cubic feet of recoverable gas. If 500,000,000 feet of gas should be taken from the Panhandle district each day this gas would last for 24 years. In these figures the porosity is taken at 20 per cent and the recovery at 50 per cent. Gas recovery is usually more than this, but this gives a conservative figure. If the recovery is figured as high as 80 per cent, which is not unreasonable, the gas will last at the above rate for 38.5 years.

As stated above the outline on the map encloses only that land that will produce wells of 10,000,000 cubic feet or more daily capacity. The actual capacity of wells already drilled in this area ranges from 10,000,000 cubic feet to over 100,000,000 cubic feet. The average well will produce about 20,000,000 cubic feet per day. From 15 wells in Potter County we have a daily gauged capacity of 148,536,000 cubic feet or 9,902,000 cubic feet per well. From 12 wells in Carson County we have a daily gauged capacity of 333,000,000 cubic feet or 27,750,000 cubic feet per well. From four wells in Hutchinson County we have a daily gauged capacity of 163,495,000 cubic feet or 40,873,000 cubic feet per well. From seven wells in Wheeler County we have a daily gauged capacity of 233,312,900 cubic feet or 33,304,000 cubic feet per well. In addition to this we have a large number of wells in which gas has been shut in which would add considerable to the total.

The following is estimated capacity of a large number of wells not included above:

County—	Number wells	Total estimated capacity	Average daily capacity
Potter	6	160,500,000	26,750,000
Hutchinson	60	920,000,000	15,333,333
Gray	32	592,00,0000	18,500,000
Moore	11	336,500,000	30,500,000
Carson	61	1,370,000,000	22,459,000
Wheeler	23	365,500,000	16,613,000
Total	231	4,502,000,000	19,490,000

The total given above includes both estimated and gauged wells and gives a daily capacity of 4,500,000,000 cubic feet. Since in general practice only 20 per cent of the capacity of a gas well is used we obtain an amount of approximately 1,000,000,000 cubic feet of gas available for use at the present time.

Decline in Gas Pressure

The evidence of decline in gas pressure from the original pressure of 430 pounds per square inch is obtained mainly from the Borger district. Here the pressure began dropping rapidly in the summer of 1926 and during the winter of 1926 and 1927 the decline in pressure averaged 20 pounds per month in the heart of the field. Some wells that were making large quantities of gas lost pressure at the rate of 30 pounds per month. In October, 1926, the average pressure on wells between Borger and Dixon Creek was about 320 pounds and by June the average pressure in this area was 160 pounds with some of the earlier wells down to 120 pounds. Gas was wasted in the drilling of wells amounting to as much as 325,000,000 cubic feet per day for weeks at a time. After the wells were drilled much of this gas was delivered to gasoline plants and gasoline plants in the Panhandle district now have a capacity of 648,000,000 cubic feet per day. Running at 80 per cent capacity these plants will use 518,400,000 cubic feet from which the gasoline is extracted and the residue is used in lease operations, drilling and in carbon black plants. In addition to this amount it is estimated that 200,000,000 cubic feet daily is being blown into the air in Hutchinson County alone which serves no use whatever. It is also estimated that a like amount is wasted in the other districts producing oil. In as much as the gas and oil reservoirs are in communication the wastage is detrimental to the whole field. If we assume that the Panhandle district is producing and wasting 500,000,000 cubic feet daily at this time we find that the entire reserve of 4,436,000,000,000 will be depleted in 24 years. With additional gas marketed through gas lines now being laid, the life of the field will be materially shortened.

The pressure in some of the wells of the Borger district is now down to 100 pounds or less and the pressure in the Sanford area down to 350 pounds and that in the Pampa Pool down to 275 pounds makes it evident that a decline has set in which will affect the whole Panhandle. It is true that when the pressure is greatly reduced in one district the differential pressure between it and the main reservoir causes a movement of gas from the main reservoir to the area of low pressure. This slows up decline somewhat even when the amount of gas taken from the reservoir is not diminished. It is a serious problem for both oil and gas producers to face. When it is understood that the quantity of gas in the reservoir is directly proportional to the pressure it is seen that when the pressure is off 75 per cent the quantity of gas is likewise depleted 75 per cent. Though, of course, some of the gas may be replaced by migration from adjacent areas.

Gas in Producing Oil

As indicated above, pressure in the

(Continued on Page 273)

*Published by permission of the Midwest Refining Co. and J. H. Clark, vice president of the Midwest Exploration Co., and by courtesy of the Bulletin of the American Association of Petroleum Geologists.

[1]Oil and Gas Fields of the Texas Panhandle by C. Max Bauer, Bulletin A. A. P. G., Vol. 10, No. 8, pp. 733, 746, August, 1926.

[2]U. S. G. S. Water Supply Papers 154 and 191 by C. N. Gould.

MAP OF THE TEXAS PANHANDLE SHOWING OUTLINE OF GAS LAND

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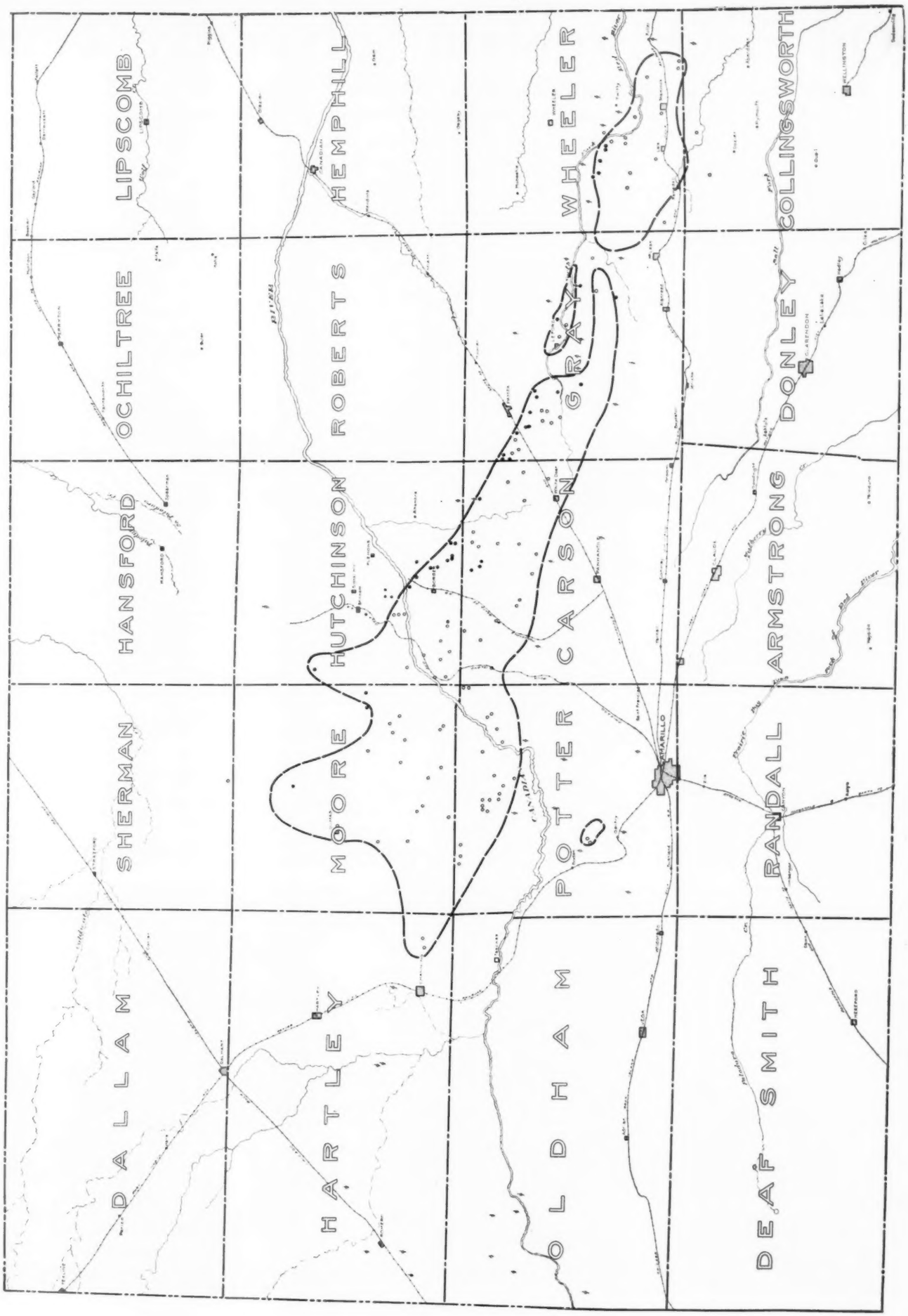
By C. Max Bauer



Oil Field Problem Solved By Tents

Life of Tent Dweller What He Makes It—Cheery or Comfortless, Clean and Sanitary or Breeding Place for Germs

By Thomas F. Smiley

To the stranger visiting Seminole or any other comparatively new oil field one of the most striking of its bizarre features is the hundreds—probably thousands—of persons living in tents. Curiosity is increased with the approach of freezing weather by the apparent absence of any intention on the part of their occupants to abandon them. Tent life in an oil field is simply putting the vacation camp idea into practical use and it is pretty much what the tent dweller himself elects to make it—cheery and homelike, or dismal and comfortless, clean and sanitary or a breeding spot for disease germs, convenient and step-saving or awkward and legwearying. Whatever it may be in these respects it has proved to be a rough-and-ready solution of the housing problem—sometimes a stupendous one—in a new oil field.

As for the reason why the tent dweller in the Seminole Field seems so slow about getting ready for winter, there only is to be said that he is ready. He's going to stay where he is.

The tent dweller represents an established group in the population of the Seminole Field—and for that matter in all similar oil fields. In all five major pools of that area—Searight, Earlsboro, Bowlegs, Seminole and Little River—a large proportion of the oil workers live in this type of dwelling with wife and children—and dog, if there be one. Here go on from day to day the processes which make up the round of human life. Men and women eat and sleep here. They work and play. They are born and they die in these tents.

It is not hard to see why the tent appeals to a large percentage of the folk who flock to the spot where a big oil pool has been discovered. To begin with the tent dweller does not have to pay ground rent if his tent is erected on land owned or leased by the operating company that employs him. If he has to use other land he may be charged a rental of $1.50 a month. That bugaboo of ordinary mortals—the landlord—means nothing in the life of the tent dweller.

Furnishings cost little, for usually the oil worker is a handy man with tools and, except for the stove—ordinarily a second hand one—he can, and does, make the few simple pieces required. There must be a bed, a place for tableware and cooking utensils and a chair or two. The tent itself, obtained ready-made of 10-ounce duck, 14 by 16 feet, costs about $18.

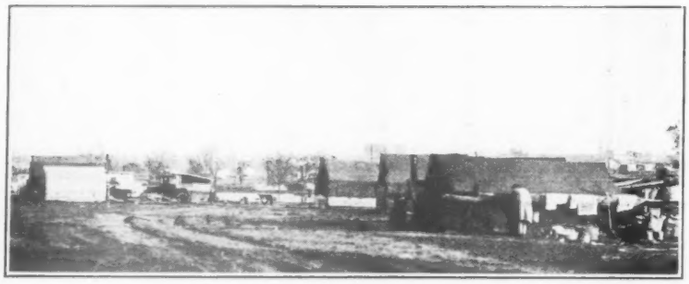
Comparison of the initial outlay represented here with that involved in the renting and outfitting of even the most modest frame dwelling, makes it clear that whatever unpleasant features may attach to tent life, it has its advantages too.

Some Tents Floorless

In its least pretentious, and also its least comfortable and least healthful, form the oil-field tent has no floor. Boards 1 inch thick and 12 inches wide are set on edge on the ground about the bottom of the four walls of the tent. These boards are nailed to stakes driven into the ground, thus being held firmly in place and forming a box, 14 by 16 feet, without top or bottom. The bottoms of the four tent walls then are tacked firmly to the outside of these four boards. A trench dug around the tent serves to keep it fairly dry even in times of rainstorm, but at best this tent makes an unsatisfactory kind of home. Notwithstanding the protection afforded by the trench, snow and rain at times make the ground floor damp, and it is needless to say that the dirt floor cannot compare favorably with one made of boards.

Most of the tents are provided with board floors and in this case it is customary to build board walls about 5 feet high, extending from the ground to the eaves of the tent. These wooden side walls are inside the tent of course. They are fastened to studding made of two-by-fours.

A person driving about through the Seminole Field sees children of all ages and sizes playing about the tent homes. "Where do they all sleep?" is a common question. A peep inside the tent would disclose how easily and practically that question has been met. Instances are cited in which parents and eight children are quartered in one of these 14 by 16-foot tents.



Washday at the tent.

The tents are provided with "one-story" or "two-story" bunks in accordance with the size of the family. The first-story bunk is close to or directly on the floor. The second-story bunk is above that. The two-story bunk easily provides sleeping quarters for a couple and two, or even three, children. For a larger family a third-story bunk must be provided or else some sort of cot, which can be put out of the way in the daytime, has to be installed.

The tents are lighted by gas or by the old-fashioned kerosene lamp. Where tents are on company property it is common practice to pipe gas to them, thus providing both fuel and light. The stove most used is a combination gas and coal range. Thus gas can be used if it is available. It it is not, or if the gas supply fails for any reason, the tent dwellers can use wood or coal. In warm weather the stove often is kept outside the tent.

The pieces of furniture, the table, the chairs and something to serve as a sort of combination china closet, kitchen cabinet and sideboard—may be as rude or as prettily finished as the taste, the ingenuity and the available time of the occupants determines.

Water usually is piped to a point convenient to the tents by the oil company. Occupants of several tents will draw their water supply from one faucet.

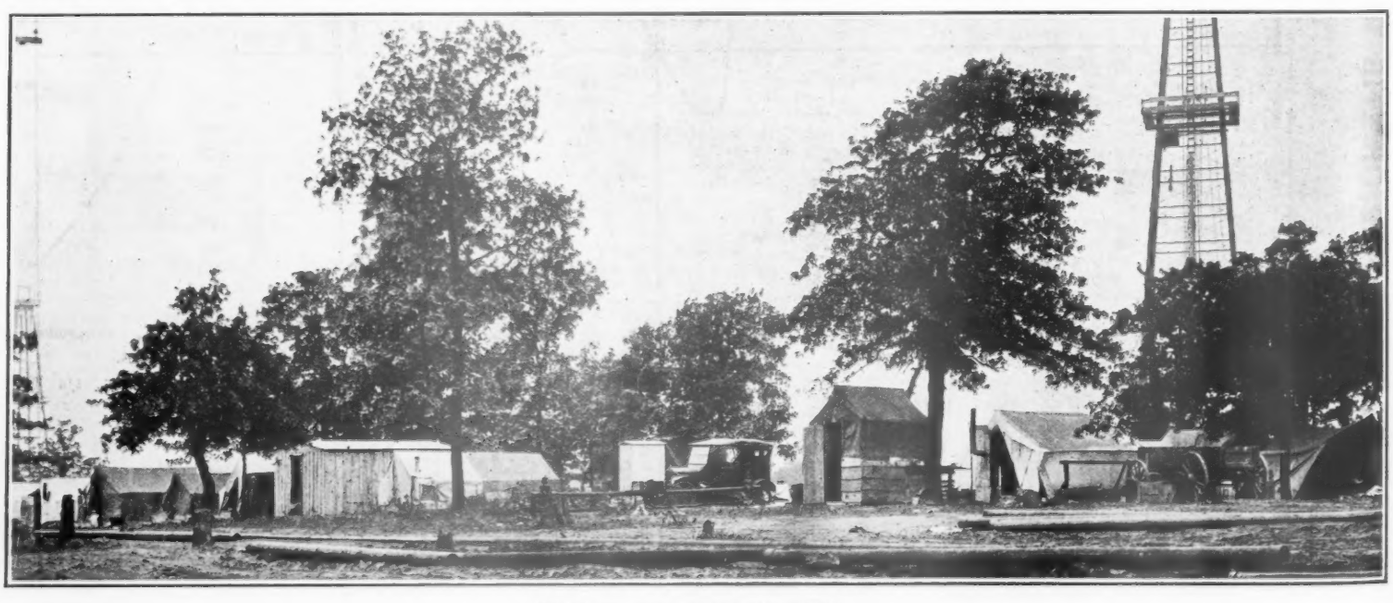
The Saturday Night Bath

Ordinarily wooden tubs set on a bench (outside the tent in summer and inside in winter) provide for washday. If the housewife desires to boil clothes a tin or copper boiler set on her stove enables her to do it. For the Saturday night bath the wooden washtub is used instead of the porcelain-lined affair, with its attendant elegancies, that is regarded as a necessity by most folk. However, there are plenty of men high in the oil business today whose boyhood was passed in country homes, far from modern conveniences, and these recall days when the weekly ablutions (one bath a week was considered the acme of personal cleanliness then) were performed in just about the same way as that in vogue among the oil-field tent dwellers. Water for the bath is obtained by heating it on the stove of course.

Where do the adult tent dwellers and the little tent dwellers keep their good clothes? (For an observant eye discovers that they have good clothes.) That's easy. A strong piece of rope or a wire is stretched taut across the back part of the tent by fastening screw-hooks into the wooden wall or into the upright pieces of studding. The family wardrobe is hung on this line, with a curtain concealing it from view. Occasionally an expensive wardrobe trunk is found in a tent home.

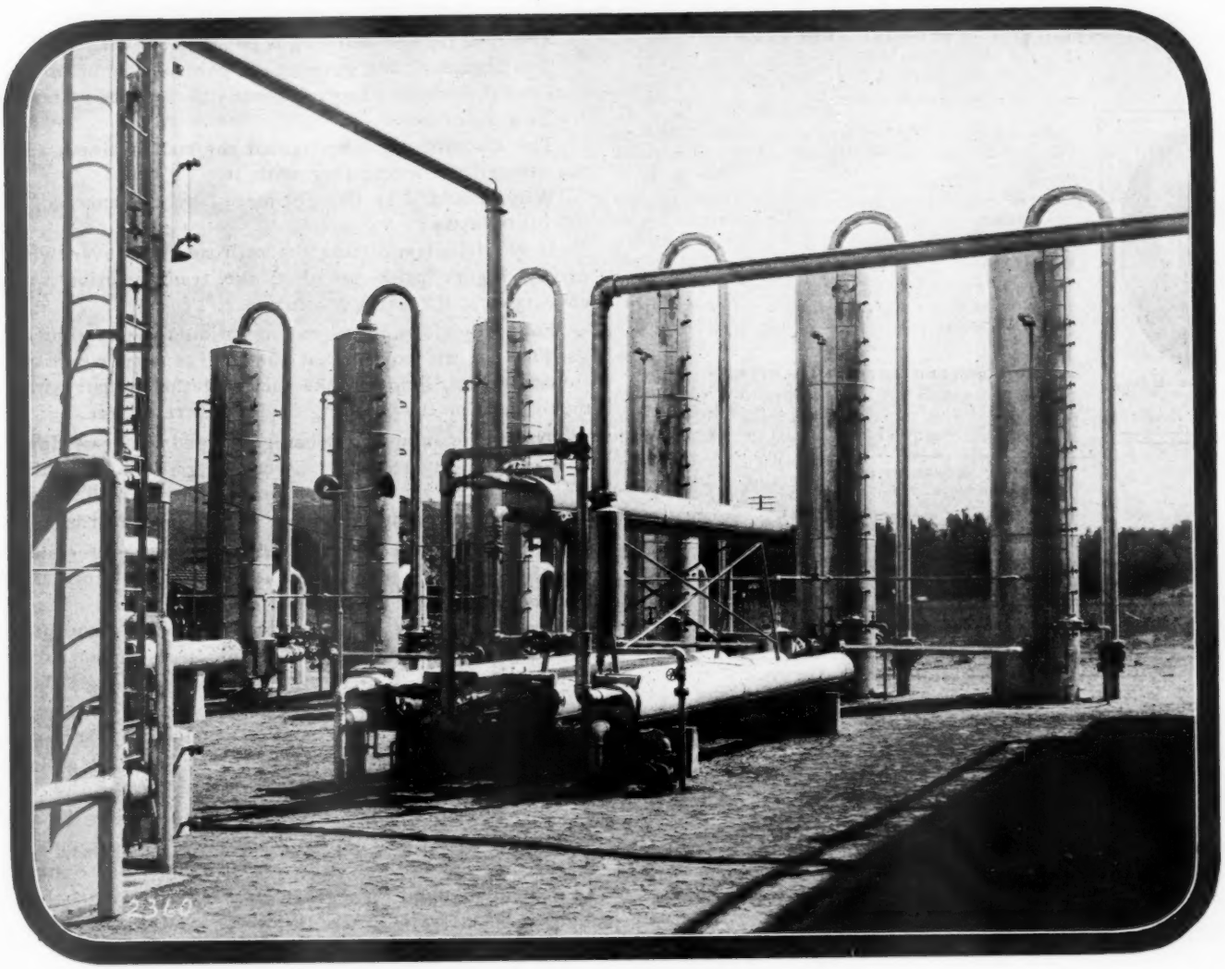
Many tent homes have luxuries. Some have phonographs. The boy or girl with a penchant for ukeleles, saxophones or brilliant-hued sweaters may exercise it here as well as in the more permanently constructed home. The daily newspaper

(Continued on Page 286)



Typical tent street in the Seminole Field.

MOST EFFICIENT—MOST ECONOMICAL



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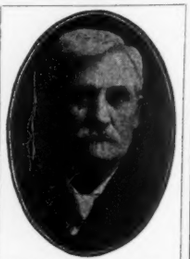

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LET THE INDUSTRY DO IT

The immediate need for the oil industry, facing a demand upon Congress for regulation of oil production, is that oil men get together on a positive statement of the industry's position.

The meeting of the American Petroleum Institute at Chicago on the same day as Congress offers the opportunity. All that is needed is the determination and action.

It is not to be expected that the industry can be unanimous, any more than that Congress can be unanimous. But there are certain principles upon which the bulk of the oil industry can agree and it is this opinion that should be emphatically presented to Congress and to the country.

First, that it is unalterably opposed to government regulation of production, because it is unconstitutional, and because it will not work.

Second, that what the Government lacks the constitutional power and the industrial ability to do is being and can be done by the industry itself.

Third, that the only thing the Government can or should do is to remove the threat of prosecution under the antitrust act which alone hampers the industry in taking the most effective steps for the fullest conservation of our oil supply.

In short, that there is no need for the Government to attempt what the industry has shown it can do if given freedom to do it.

A clean-cut declaration to that effect, made with the authority of the American Petroleum Institute, representing the industry at large, would clear the air and substitute a practical program for visionary theories.

The Oil and Gas Journal has assembled in this issue, under the title of "The Oil Industry's Answer Today," the facts and arguments supporting that platform. They are, we believe, unanswerable.

There may be dissenting discussion but it will not be upon the facts but upon theories that ignore the facts.

The statements upon constitutional and legal points are made upon the authority of the leading counsel associated with the Institute and the industry.

The statements regarding actual operations in the industry will be recognized by all oil men as absolutely accurate.

They prove beyond question the impracticability of attempting to substitute government regulation for ordinary economic processes of industry.

The record of what the industry has accomplished in the actual conservation of oil is attested by the Government's own figures.

The case for the industry is complete, backed by demonstration.

The argument for government control cannot point to a single successful instance of government interference bettering an industry or a business.

The Government investigated the coal business and abandoned the thought of interfering with it.

Why should it be thought more likely to succeed in regulating the oil industry?

It has tried regulating the railroads and, even with control of prices, higher prices at that, the transportation system of the country is still seeking a solution.

Four years ago there was agitation for government control of gasoline on the notion that the oil industry was charging extortionate prices, ignoring the fact that the industry was making so much gasoline it was being sold at distress rates.

Today the industry is being charged with wasting oil when it is saving so much crude it is carrying the burden of the heaviest stocks in history, a burden so heavy that it forced the price of crude and refined petroleum products to new low records.

Our critics forget that the industry is more interested in assuring our future supply of oil than anyone else possibly can be because the industry must have oil to continue in business. The eleven billion dollars invested in the oil business is not concerned only with drilling wells and producing oil. Back of that are the immense pipe line systems, the great fleets of tankers, the 150,000 tank cars, the vast refineries that dot the coasts and spread over the interior, the 165,000 service stations and nearly 100,000 gasoline pumps, with all the necessary appurtenances connected with the marketing of petroleum products throughout the country and the world.

Waste of our crude oil reserves would hasten the disappearance of all this investment unless a substitute were found to serve as a marketable motor fuel. Is it reasonable to assert that an industry so dependent upon its raw material is wilfully wasting it?

If it has overproduced oil it was because it has felt that it was powerless to prevent it under our laws which seemed to prohibit the co-operation that alone could check that overproduction.

There could be no other explanation. Aside from the natural desire to conserve its raw material, so uncertain in supply, the industry saw its prices slashed to shreds by overproduction that compelled many to sell for what they could get to avoid bankruptcy.

Common sense would impel any producer of any commodity to keep his production in line with demand in order to assure living prices. The oil producer knew this and had it impressed upon him so frequently that had there been any way to regulate production he would certainly have done so.

But he was bedeviled with the fear of antitrust prosecution if he so much as conferred with another producer regarding an agreement to keep production down to demand.

At least, that was his condition until Seminole and West Texas and the encouragement given by the Federal Oil Board led producers to take the risk of attempting co-operation in regulating production in the Oklahoma field.

The question now is whether the oil producer is to go forward or halt and let West Texas overwhelm him as Seminole did in the early stages.

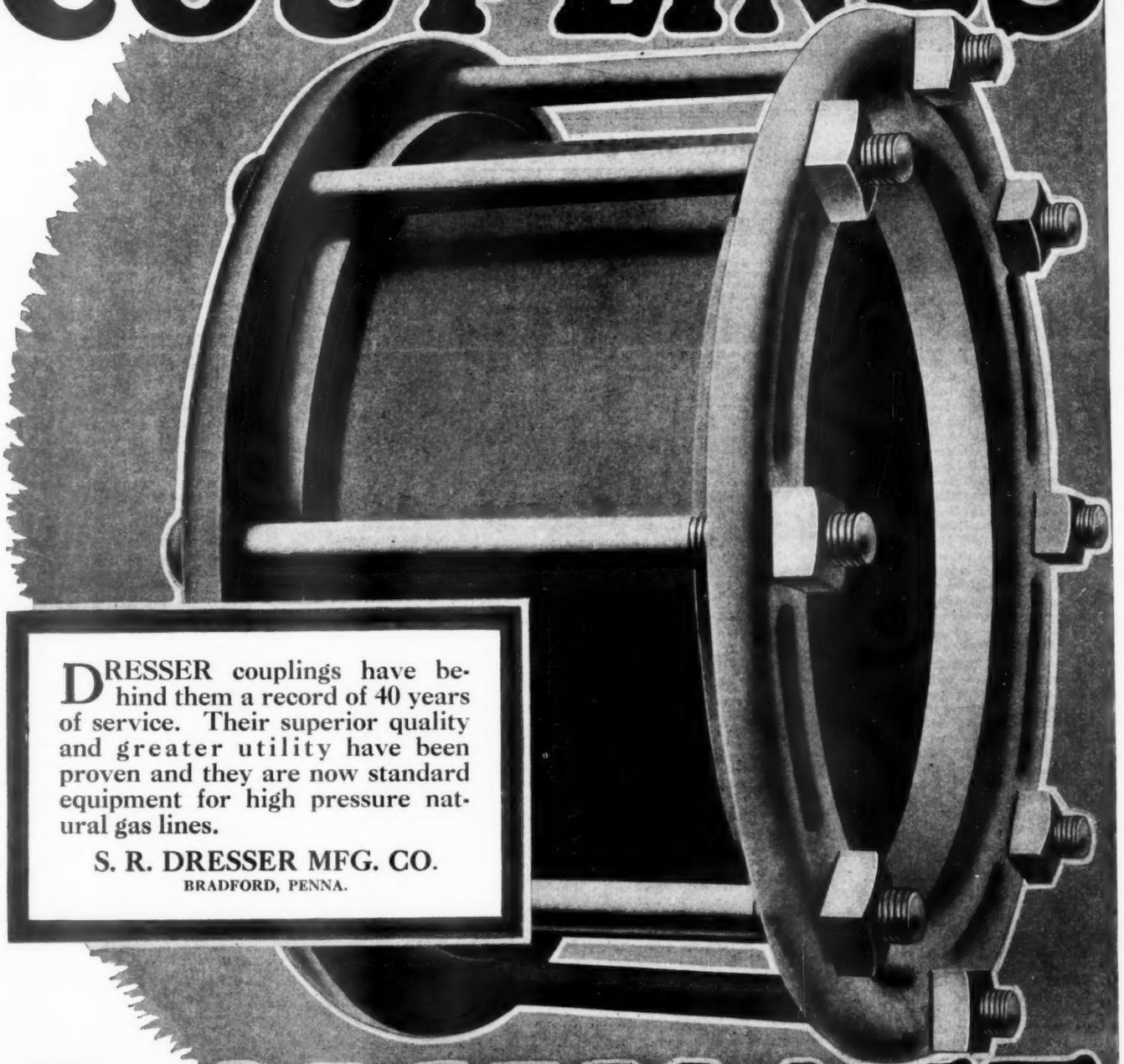
As a practical oil man he knows there is no hope of successful regulation of production by governmental interference, even if it were possible under the Constitution.

He recalls a sample of government operation in the appropriation for an experimental shale oil plant in Colorado which, after producing oil, was forced to shut down because Congress had failed to continue the appropriation.

He reflects upon the woefully inadequate support given to the Bureau of Mines by Congress and asks if the proposed regulation

(Continued on Page 56)

DRESSER COUPLINGS



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S. R. DRESSER MFG. CO.
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DOMINATE

Gray County is Panhandle Feature

One Bowers Pool Well Comes in Making 4,250 Bbls. and Another Increases When Agitated to 5,500 Bbls.

By James H. Dameron
Staff Correspondent, Texas Panhandle

AMARILLO, Tex., Nov. 28.—Completion of Danciger Oil & Refining Co.'s No. 3 Jackson, SE SW NW, Section 88, Block B-2, in the Bowers Pool of Gray County and other developments in that pool were the outstanding features of the Panhandle during the week. Danciger company's well came in making 4,250 bbls. from 2,940-48 feet and 2,955-66 feet.

Diagonally southeast, the Delaney well in the southwest of Section 88, rose in production to 5,500 bbls. daily when agitated but started showing water. The well was completed early in October making 198 bbls. per hour from pay at 2,982-85 feet. A couple of days before the completion of the Danciger company's well, the Delaney well was making around 3,500 bbls.

Several other completions of less importance were recorded in that area during the week and it continues to be the "hottest" spot in the Panhandle.

About half way between the general trend running east from the Travis well in eastern Gray County to the Pampa Pool, Amagray Oil Co.'s No. 1 A. Chapman, SW NW SW, Section 9, Block 26, was completed flowing and swabbing 211 bbls. from 2,660-2,725 feet. Scattered production has been found in that general area but nothing has been discovered thus far to throw that section of the county into a frenzy of excitement.

In the Sanford Pool, western Hutchinson County, Phillips Petroleum Co.'s No. 1 J. M. Sanford land came in making 532 bbls. daily from 2,967-75 feet. Antelope Creek Oil Co.'s No. 2 J. M. Sanford, in the same pool, was put on gas lift and is making 250 bbls. of salt water daily. The well had a small showing of oil in lime at 3,050 feet. Gordon and associates' No. 1 Sanford topped the pay in lime at 2,987 feet and bottomed at 3,009 feet and is swabbing 85 bbls. of oil daily.

McIlroy Pool

Roxana corporation's No. 2 Cockrell, in the McIlroy Pool of southeastern Hutchinson County, is not proving as large a well as was speculated upon. The well had the pay at 2,953 feet and is cleaning out at 2,978 feet and flowing only 25 bbls. per day. R. J. W. Oil Co.'s No. 1 Cockrell, in the same pool, was shot with 900 quarts at 2,838-40 feet and flowed 200 bbls. the first 17 hours.

Last Chance Oil Co.'s Carson County semiwildcat test, No. 1 J. W. McConnell, SW cor. Section 201, I. & G. N. Survey, Block 3, swabbed 100 bbls. from granite wash pay at 3,250-87 feet and is to be drilled deeper. The well is about 2 miles northeast of Kingsmill and about 2 miles southwest of the McConnell Pool.

Empire Gas & Fuel Co. has completed its present gas well drilling program on the Burnett ranch in Carson County and now has 14 wells completed and shut in. No. 6 Burnett was the last to be completed and made 40,000,000 feet. The total open flow capacity of the 14 wells is figured at 417,000,000 feet of gas daily. Ten of the fourteen wells were completed on the Burnett ranch and the other four were in eastern Gray County. It is estimated the Empire company will send around 90,000,000 feet of gas daily through its Panhandle-Wichita, Kans., line when it is completed the latter part of December.

Production in the Panhandle showed a decrease of 230 bbls. last week despite gains in the Bowers area of Gray County. Carson County gained 315 bbls. in daily average and Gray County gained 720 bbls. Production by counties is as follows:

	Bbls.
Carson County	7,610
Gray County	14,875
Hutchinson County	57,980
Moore County	100
Potter County	30
Wheeler County	1,100
Total	81,695
Total last week	81,925
Loss	230

New Locations

Seven locations for the Panhandle were reported at the close of the week and are as follows: Gray County, St. Clair Oil Co.'s No. 1 C. H. Rowe, 330 feet out of the northeast corner, Section 32, A. D. Heiman Survey. Danciger Oil & Refining Co.'s No. 5 Jackson, SE cor. NE NW, Section 88, Block B-2; Phillips Petroleum Co.'s No. 1 M. Davidson (Myson), 290 feet from the west line and 330 feet from the north line of W half NW, Section 87, Block B-2; Shamrock Oil Co.'s No. 1 W. S. Clayton, 330 feet out of the NE cor. of the east 90 acres of the SW, Section 50, Block 25.

Wheeler County, Hatcher and associates' No. 2 fee, C NW SW, Section 80, Block 23; Woodtex Oil Co.'s No. 2 C. A. Linkey, 660 feet south and 330 feet east of NW cor. NE, Section 126, Block 23; Kaufhold and others' No. 1 E. R. Wallace, C SW SE, Section 47, Block 23, H. & G. N. Survey.

COMPLETIONS

Carson County

Amatex Development Co.'s No. 1 E. S. Polling was temporarily abandoned at 2,110 feet. Empire Gas & Fuel Co.'s No. 6 Burnett estate, C NE, Section 62, Block 5, I. & G. N. Survey, was completed as a 40,000,000-foot gas well at 2,237-2,412 feet. Magnolia Petroleum Co.'s No. 5 fee No. 244 topped the pay in lime at 3,090 feet and bottomed at 3,158 feet. The well made 450 bbls. the first 24 hours and when it was formerly completed it was good for 220 bbls. initially.

Gray County

Amagray Oil Co.'s No. 1 A. Chapman, SW NW SW, Section 9, Block 26, H. & G. N. Survey, flowed and swabbed 211 bbls. the first 24 hours. The well was drilled to 2,786 feet where some salt water showed. The hole was plugged back to 2,730 feet. A show of gas was encountered at 2,010-2,110 feet, 2,000,000 feet of gas at 2,150-55 feet. Granite wash was topped at 2,280 feet, the first show of oil was found at 2,579 feet, another showing at 2,610-15 feet and 2,000 feet of oil rose in the hole from 2,623-25 feet. The best showing was found at 2,660-65 feet and at 2,718-25 feet.

Camel Oil Co.'s No. 1 W. Harrah, Section 163, Block 3, I. & G. N. Survey, was shot with 420 quarts at 3,122-3,285 feet and flowed 270 bbls. the first 24 hours. The hole was drilled to 3,350 feet and plugged back to 3,285 feet. Danciger Oil & Refining Co.'s No. 3 Jackson flowed 4,247 bbls. the first 24 hours from granite wash at 2,940-48 feet and 2,955-66 feet. The well is located in the SE SW NW, Section 88, Block B-2, and was drilled in with rotary tools.

Empire Gas & Fuel Co.'s No. 1 J. F. Meers made 440 bbls. initially from 3,306-28 feet and averaged 300 bbls. daily for the first six days. Navillus Oil Co.'s No. 1 fee, NW cor. E half SW, Section 1, Block 1, A. C. H. & B. Survey, made 100 bbls. of oil and 30 bbls. of salt water after a 210-quart shot at 2,651-2,804 feet. The hole was drilled to 2,839 feet and the last 10 feet was plugged off. A 3,000,000-foot showing of gas was found at 2,170-80 feet and 30,000,000 feet of gas at 2,240-2,300 feet. Operators Oil Co.'s No. 2 J. B. Bowers, NE cor. Section 35, Block 3, I. & G. N. Survey, was completed at 2,855 feet as a 30,000,000-foot gas well. The hole was drilled to 3,431 feet and plugged back to 2,866 feet. A showing of oil was found at 3,097-3,181 and 3,200 feet, and the big gas was encountered at between 2,615-2,855 feet.

Pure Oil Co.'s No. 4 H. Davis made 320 bbls. the first 24 hours from 3,252-60 feet. The well has some gas at 2,803 feet and at 2,952 feet. A showing of oil was found at 3,090 feet and the well made 30 bbls. from granite wash at 3,155-3,200 feet. The Texas Company's No. 1 Brown was bottomed at 3,630 feet and plugged back to 3,320 feet and then to 3,275 feet and it made 39 bbls. initially from sandy lime at 3,225-55 feet. Location for Wilcox and others' No. 3 Combs and Worley has been temporarily abandoned. The rig for J. Williams and associates' No. 1 C. W. Bradford has been temporarily abandoned.

Hutchinson County

Phillips Petroleum Co.'s No. 1 J. M. Sanford (Land) topped the pay in lime at 2,967 feet and bottomed at 2,975 feet and made 532 bbls. the first 24 hours.

Wheeler County

Gibson Oil Corp.'s No. 7 H. C. Phillips has been temporarily abandoned.

WILDCAT OPERATIONS IN PANHANDLE

Week Ending November 26, 1927

Company, Well, Farm, Name, Section and Block—	Remarks—
ARMSTRONG COUNTY	
Meadows et al's No. 1 E. D. Harrel, C Sec. 100, Blk. A-6, A. & G. Sur.	900 ft. wtr., 4,605 ft; S.D., 4,700 ft.
United Oil & Trust Co.'s No. 1 J. P. Reck, Sec. 162, Blk. 4, H. & G. N. Sur.	Spudded and temp. abd., 298 ft.
BAILEY COUNTY	
Gibson Oil Co. et al's No. 1 Webb Miller, NE cor. Sec. 15, League 186, Swisher County school land	Rig.
Humble O. & R. Co.'s No. 1 W. H. Fuqua, C E ½, Sec. 117, Blk. A, Melvin, Blum & Blum Sur.	Drlg., 1,810 ft.
BRISCOE COUNTY	
C. S. Rice's No. 1 J. C. Anderson, SE cor. NW NW, Sec. 22, Blk. B-3, B. S. & F. Sur.	S.D., 1,620 ft.
CARSON COUNTY	
Amatex Dev. Co.'s No. 1 E. S. Polling, Sec. 22, Blk. 2-Y.	T.A., 2,110 ft.
Empire G. & F. Co.'s No. 8 Burnett est.	Drlg., 2,451 ft; 8,000,000 ft. gas.
Marston Oil Co.'s No. 1 J. L. Noel	S.D., 3,064 ft.
Navajo Oil Co.'s No. 1 E. S. Polling, Sec. 22, Blk. 2-Y.	Set 6-in., 2,496 ft; S.D., 2,712 ft.
The Texas Company's No. 2 C. R. Garner	Drlg., 1,059 ft.
The Texas Company's No. 1 Chas. Kalka	Spudding.
Last Chance Oil Co.'s (formerly R. M. Waggoner's) No. 1 J. W. McConnell (was completed for 37,000,000 ft. of gas, 2,255-2,500 ft.)	Top pay, 3,250 ft; S.D., 3,287 ft; I.P. 100 bbls. per day; may deepen.
Willis et al's No. 1 Burnett est., C SE SW NW, Sec. 111, Blk. 5	Drlg., 2,512 ft.
CASTRO COUNTY	
Colorado O. & R. Co.'s No. 1 M. Slemmons, SW cor. Sec. 78, Blk. M-17, B. S. & F. Sur.	Rig blown down.
Mystery Oil Co.'s No. 1 J. I. Crum, SE cor. NE, Sec. 333, Blk. M-6, S. K. & K. Sur.	S.D., 510 ft. for casing.
CHILDRESS COUNTY	
Continental Oil Co.'s No. 1 B. P. Smith, C NE, Sec. 14, Blk. 9	Wtr., 2,450 and 2,800 ft; 100 ft. sulphur wtr., 3,350-55 ft; drlg., 3,435 ft; 1,700 ft., sulphur wtr.
Hoover & Calloway's No. 1 O. L. Tucker, Sec. 736, Haggard Sur.	Spudded and S.D.
C. L. Sloane et al's No. 1 B. P. Smith, Sur. 49, F. P. Knott lands	Set 6-in. pipe, 2,902 ft; T.D. 3,050 ft; S.D., 3,200 ft.
COTTLE COUNTY	
Exploration Co.'s No. 1 Richards	Spudded and S.D.
DALLAM COUNTY	
Wood Bros. et al's No. 1 Capitol Synd., Sec. 19, Blk. 17	Hole full wtr., 4,007-4,127 ft; T.D. 4,188 ft; S.D. until Spring.
Marland Oil Co.'s No. 1 A. M. James, C SW W ½, Sec. 21, S. H. McElreath Sur.	S.D., 2,445 ft. for wtr.
Marland Oil Co. et al's No. 1 Capitol Synd., Sec. 36, Blk. 18, Capitol Synd. land	Drlg., 2,990 ft.
DONLEY COUNTY	
A. T. Drlg. Co.'s No. 1 F. E. Harrington, Sec. 39, Blk. 3-C	1,200 ft. wtr., 3,115-22 ft; show gas, 3,140-60 ft; dry grnt. wash, 3,260-93 ft; S.D., 3,498 ft.
FLOYD COUNTY	
Explin. Co.'s No. 1 S. H. Boone, C. C. H. Johnson Sur.	Spudded and S.D.
Explin. Co.'s No. 1 Land & Cattle Co.	S.D., 780 ft. for orders.
Hoffer Oil Corp.'s No. 1 Nelson	Spudding.
GRAY COUNTY	
Archer Blake's No. 1 Turneaux, SW cor, Sec. 111, Blk. B-2	Drlg., water well.
Bay Shore Oil Co.'s No. 1 C. W. Bradford, Sec. 143, Blk. 2-B	T.D., 2,666 ft; S.L.M. shot with 10 qts. to loosen bit and 8-in. collapsed.
Camel Oil Co.'s No. 1 B. E. McKinney	Rig.
Cole O. & G. Co.'s (was Magdalene Oil Co.'s) No. 1 J. E. Williams, Sec. 17, Blk. 1	S.D., 3,860 ft.
Danciger O. & R. Co.'s No. 2 W. Jackson, SW SE, NW, Sec. 88, Blk. B-2	T.D., 2,750 ft; run 8-in; rig burned.
Danciger O. & R. Co.'s No. 4 W. Jackson	Cmtng. 8¼-in., 2,721 ft.
Danciger O. & R. Co.'s No. 5 W. Jackson	Rigging.
Duniey Gray Oil Co.'s No. 1 J. W. Gordon, Sec. 79, Blk 3.	Wtr., 3,380 ft. and 3,430 ft; show oil; drlg., 3,503 ft.
Delaney et al's No. 2 Jackson	Drlg., 1,855 ft.
Edwards et al's No. 1 E. J. Case, NE cor. Sec. 182, Blk. B-2, H. & G. N. Sur.	70,000,000 ft. gas, 2,512-2,630 ft; fish., 3,025 ft. for bit; show oil.
Empire G. & F. Co.'s No. 1 Sarah George, Sec. 151, Blk. 3, I. & G. N. Sur.	10,000,000 ft. gas, 3,080-3,130 ft; 800 ft. oil, 3,150-58 ft; increase 3,220 and 3,317 ft; shot with 60 qts., 3,320-29 ft; flowing and swabbing 20 bbls. first 24 hrs.
Gardner et al's No. 1 G. H. Saunders	Cellar.
Gibson Oil Corp.'s No. 2 J. B. Bowers	Lost hole, 2,910 ft; skidded rig; S.D., 1,950 ft.
Gurney Oil Co.'s No. 1 B. E. McKinney	Drlg., 1,200 ft.
Lefors Pet. Co.'s No. 1 Leach, Lefors Townsite	10,000,000 ft. gas, 2,440-50 ft; 70,000,000 ft. gas, 2,625 ft; T.D., 2,650 ft; trying to pull 8-in. and it parted; fishing.

(Continued on Page 281)

Yates Has 4,000 Foot Extension

Well Flows 30 Bbls. an Hour 6½ Miles Northwest of River Bed Production. Pipe Line Development

By C. D. Lockwood
Staff Correspondent, North and West Texas

FORT WORTH, Tex., Nov. 28.—Another 4,000-foot extension to the Yates Pool in eastern Pecos County which was predicted last week became a reality when Kirby Oil Co. and Edson's No. 1 Tippett offsetting the SW cor. of the Runnels County school land started flowing 30 bbls. an hour at 1,293-1,375 feet. This well is 6½ miles northwest of the River Bed producers and "the end is not yet." The Yates Pool is already so big that a mere extension is of importance only to the companies owning acreage in that direction and to those fortunate individuals who possess royalty interests in that part of the county, but nevertheless this development was the chief event of the week so far as field development is concerned.

Four new tests have been started around the Kirby well. McMan Oil & Gas Co. has offset it on the south, Humble company has started No. 3 Smith-B in the NW cor. of Section 101, southeast of it, and Gulf Production Co. is moving in materials for Nos. 4 and 5 Yates in the SW cor. of its lease in the Runnels County school land. The Kirby well has not been completed and may be a better well when deepened, although it is a good producer now.

Pipe Line Developments

Pipe line developments attracted unusual interest this week in West Texas. Magnolia Petroleum Co. has finished its 8-inch carrier from Midland to DeLeon and is testing it with water. Oil will probably be running through this line by December 1. When the three pump stations now under construction are completed it will have a capacity of 17,500 to 20,000 bbls. but only one station will be in operation next week so the line will not run to capacity for a time.

The Shell Pipe Line Co., subsidiary of the Dutch-Shell interests and sister organization of the Roxana Petroleum Corp., has established a pipe line camp near the Hendrick Pool in Winkler County preparatory to laying a 6-inch line from that field to the Church-Fields Pool in Crane County and the McCamey district of Upton County. This is part of a big pipe line project, announced some time ago, involving the construction of a trunk line from Upton County to a point in southern Oklahoma connecting with the Shell Pipe Line Co.'s main system to St. Louis. Its gathering system in West Texas will also include a line to the Yates Pool.

Actual construction work also started last week on the 10-inch welded line of the West Texas Pipe Line Co., subsidiary of the Atlantic Refining Co., which was announced a few weeks ago.

Gulf Pipe Line Co.'s 8-inch carrier from the Yates Pool to Rankin on the Orient Railroad is completed and will be able to handle about 18,000 bbls. daily but awaits the completion of a loading rack. The line will probably not be operated to capacity because of conditions in the Yates Pool as well as the amount of sidetrack facilities at the loading rack.

Another pipe line was added to the Winkler County list last week when Independent Oil & Gas Co. announced an 8-inch welded line which will be laid from the company's leases in the Hendrick Pool to a loading rack at Monahans on the Texas & Pacific Railroad. This follows completion of the Independent Oil & Gas Co.'s No. 1 Ida Hendricks-A for 330 bbls. an hour last week, a well which actually flowed 7,677 bbls. one day and practically the same amount the next 24 hours, then had to be pinched down to about 1,400 bbls. daily for lack of tankage. The company also plans to lay another line from the Church-Fields Pool to Monahans later on.

With the new Atlantic and Independent and Roxana pipe line outlets, and counting the Humble Pipe Line Co.'s proposed 8-inch from its Church-Fields station, the Hendricks Pool will have an outlet for approximately 128,000 bbls. daily in the near future.

The steel storage program in the Winkler County area is also going ahead at high speed and the total capacity of tanks already built, under construction or planned, exceeds 4,000,000 bbls.

The Southern Pipe Line Co. has a capacity of approximately 26,000 bbls. daily in its two lines from the Hendricks Pool to Wickett on the T. & P., and has already increased the size of its loading rack at the latter point to about 14,000 bbls. daily. It has been handling about 7,000 bbls. daily. The loading rack of the American Pipe Line Co. at Wickett is about 5,000 bbls. capacity.

New Locations

Twenty new locations were announced in the Yates Pool of Pecos County this week, and seven in the rest of the Permian Basin including three in Winkler County. Last week there were 8 new tests in the Yates Pool and 4 in the Hendrick Pool, a total of 15 in West Texas. No letup on new drilling is in sight as long as the companies in eastern Pecos County need to build up their estimated potential production to get their share of the prorated pipe line runs.

Last week, Gulf Production Co.'s No. 3 Yates, which extended the field to the northwest, was rated good for 60 bbls. an hour. Last Thursday it flowed 1,732 bbls. through one 4-inch line.

Humble Oil & Refining Co.'s No. 2 Smith-B, near the NE cor. of Section 101, Block 194, and about a quarter of a mile southeast of Gulf's No. 3, flowed 159 bbls. an hour at 1,313-1,422 feet. Roxana Petroleum Corp.'s No. 3 Tippet, in the NW cor. of Section 102, east of the Humble's No. 2-B, topped pay at 1,525 feet and at 1,550 feet flowed 237 bbls. in 24 hours. This well topped the line 17 feet higher than Gulf's No. 3 Yates, and 8 feet lower than Gulf's No. 2 Yates, and started flowing at a depth of only 35 feet in the lime.

Gulf's No. 2 Yates, north offset to Roxana's No. 3 Tippett, topped pay at 1,258 feet and flowed 15 bbls. an hour with 3,000,000 feet of gas at 1,273 feet. At total depth of 1,289 feet Monday it flowed 712 bbls. which tested 28.5 degrees gravity, corrected.

Near Water Line

Further evidence that the widely advertised No. 2 Yates-C producer of Mid-Kansas and Transcontinental is near the water line on the east side of the field was furnished when No. 5 Yates-C was drilled in last week. At 1,032-1,130 feet, this well flowed 330 bbls. an hour, and the water content was estimated from 25 to 40 per cent. The day before Thanksgiving, this well flowed 2,405 bbls. in 15 hours with the same percentage of water. A line drawn from Marland Oil Co.'s Nos. 1, 2 and 3 Yates-A to Mid-Kansas' No. 5 Yates-C, all of which are making water, has to bend out around Marland's No. 4 Yates-A in order to avoid it. No. 4 has not made any water, and it is the eastern offset to Mid-Kansas' No. 2 Yates-C.

Another exceptionally large producer is the California Co.'s No. 7 Yates, in the southwestern part of Section 34, Block 194. It was estimated all the way from 1,000 to 2,000 bbls. an hour at 1,205 feet in pay topped at 1,182 feet.

One of the biggest gassers in the field is Mid-Kansas and Transcontinental's No. 9 Yates-A, about a quarter mile southwest of the discovery well. It made 20,000,000 feet of gas at 982 feet and was drilling ahead.

Smallwood & Dunn's (formerly Allsman & Bell's) No. 4 River Bed is now making about 1½ per cent water; No. 1, at latest report was making 22 per cent; and No. 3, 50 per cent water. The three producers together gauged 798 bbls. of net oil.

McMan and Marland's No. 10 Yates, south offset to Roxana's No. 2 Tippett, flowed 75 bbls. an hour at 1,430 feet. Roxana's No. 2 Tippett flowed 170 bbls. an hour at 1,350-1,517 feet.

How's this for an edge well? Simms Oil Co.'s No. 3 Smith, in Section 103, Block 194, a northern outpost 660 feet north of No. 2, flowed 413 bbls. the first 30 minutes Monday at 1,187-97 feet.

McMan Oil & Gas Co.'s No. 1 Tippett is located 200 feet out of the NE cor. south 80 acres of Section 108, Block 194.

Corrected location of Smallwood & Dunn's No. 11 Pecos River Bed is 4,992 feet east and 339 feet north of NW cor. Section 545, T. I. & M. Co. Survey, A-1,325, and located in the river. This is an east offset to Section 67, owned by Gulf Production Co. The well is spudding at 50 feet.

Winkler County

The most interesting well in the Hendrick area of Winkler County is Amerada Petroleum Corp.'s No. 1 Walton, SW cor. NW, Section 48. It has been standardized after coring brown lime carrying oil at 2,334 feet, and was bailed Saturday preparatory to deepening. They expected to resume drilling Monday.

Independent Oil & Gas Co.'s No. 1 Hendrick, in Section 34, was still making 1,145 bbls. Sunday through a three-quarter-inch choke, and No. 2 was drilling at 2,770 feet.

Independent's No. 1 Howe-D, in Section 44, Block 26, extended the north part of the field westward, having a hole full of oil at 2,846-2,940 feet and was shut down for storage. Atlantic Oil Producing Co.'s north offset to it flowed 50 bbls. Sunday while drilling at 2,835 feet in pay topped at 2,830 feet.

Cranfill & Reynolds' No. 2 Hendrick-A, in the NW of Section 28, Block B-5, came in for 1,500 bbls. at 2,850-2,983 feet, and made 1,200 bbls. Sunday. This well is a location east of the same concern's No. 1 which was the largest producer in the field, having flowed more than 10,000 bbls. initially.

Roxana Petroleum Corp.'s No. 1 Grisham-Hunter-C, NE cor. N half NW, Section 29, Block B-5, flowed 6,200 bbls. Sunday through a 1-inch choke against 1,000 pounds back pressure. Location has been made and rig is building for No. 2-C in the SE cor. of the same 80 acres.

Howard County

In Howard County, Vitek Oil Co.'s No. 1 Clay, Section 126, Block 29, had sands

WILDCAT OPERATIONS IN WEST TEXAS

Week ending November 26, 1927

Company, farm and location—	Remarks—
ANDREWS COUNTY	
George B. Calvin's (was Calvin & Belt's) No. 1 Ratliff & Bedford, C NE Sec. 16, Blk. A-54	Hole full fresh water 1,055 ft.; top salt 1,610 ft.; total depth 2,575 ft.; shut down.
J. S. Cosden's No. 1 Ratliff & Bedford, C SE Sec. 8, Blk. 73, Public School Land	Top salt 1,585 ft.; shut down 4,007 ft., contract depth; will deepen.
Sartain Oil Co. et al's (was Deep Rock Oil Co.'s) No. 1 W. J. Harris, C SE Sec. 12, Blk. A-46, Public School Land, elev. 3,167 ft.	Hole full fresh water 1,050 ft.; shut down 1,260 ft.
B. B. McKennon's (was Neff et al's) No. 1 J. S. Means, C SE Sec. 12, Blk. A-35, Public School Land	Shut down 1,365 ft.
A. G. Carter & Zweifel's No. 1 Cowden, C SE Sec. 18, Blk. A-52, Public School Land Sur., elev. 3,156 ft.	Top salt 1,375 ft.; encountered pocket of air 3,635 ft.; drilling 4,700 ft.
BORDEN COUNTY	
Marland Oil Co.'s No. 1 G. E. McDavid, C SW Sec. 156, Blk. 25, H. & T. C. Sur.	Drlg. 100 ft.
BREWSTER COUNTY	
Cady & Keller's No. 1 Decles	Location.
J. M. Hickey's No. 1 Jackson & Harmon, NE cor. Sec. 182, Blk. 9, G. H. & S. A. Sur.	Drlg. 400 ft.
Mid-Kansas O. & G. Co.'s No. 1 Turney, Sec. 77, Blk. 213, T. & St. L. Sur.	Drlg. 1,780 ft.
Reese & White's No. 1 Kimbale, C NE Sec. 204, Blk. 9, G. H. & S. A. Sur.	Shut down 900 ft.
Van McPhail's No. 1 McIntyre, SE cor. Sec. 59, Blk. 352, 7 mi. S of Alpine	Shut down 1,025 ft.
Wilcox & Anderson's No. 1 Gage, Sec. 8, Blk. 300, T. C. R. R. Sur.	Shut down 1,582 ft.
COKE COUNTY	
W. H. Brown et al's No. 1 W. L. Foster, SE cor. Sec. 142, Blk. 2, H. & T. C. Sur., elev. 2,222 ft.	Shut down 2,250 ft.
Danciger O. & R. Co.'s No. 1 Mrs. Byrnes, Clinton Sur.	Drilling 2,830 ft.
Lipan Oil Co.'s No. 1 S. M. Conner, Sec. 71, Blk. 2, H. & T. C. Sur.	Show oil 1,224-34 ft.; drlg. 2,930 ft.
Lipan Oil Co.'s No. 1 E. C. Rawlings, Sec. 390, Blk. 1-A, H. & T. C. Sur., elev. 2,750 ft.	Total depth 2,736 ft.; clean. out.
CONCHO COUNTY	
Parks & Lawson's No. 1 Schultz	Show oil 925 ft.; shut down 957 ft.
The Exploration Co.'s No. 1 Hartgrove, Blk. 240, J. Schouch Sur., elev. 1,718 ft.	Fish. bit 720 ft.
CRANE COUNTY	
Crane Dev. Co.'s No. 1 J. R. Mosley, S cor. Sec. 18, Blk. 6, H. & T. C. Sur.	Drlg. 450 ft.
Marland Oil Co.'s No. 1 Union Land, E cor. of W Sec. 38, Blk. 35, H. & T. C. Sur., elev. 2,298 ft.	Top salt 825 ft.; 1,300 ft. sulphur water at 2,100 ft.; flowing sulphur water 2,265 ft.; shut down.
Duffey & Gault & Brown's No. 1 Cowden, CNL S half NE Sec. 22, Blk. X, C. C. S. D. Sur.	Hole full fresh water 620-25 ft.; top salt 895 ft.; top lime 2,729 ft.; show oil 3,030 ft.; drlg. 3,040 ft.
Gulf Prod. Co.'s No. 3 W. N. Waddell, SE cor. NE Sec. 3, Blk. B-25, Public School Land	Drlg. 300 ft.
J. K. Hughes Dev. Co.'s No. 1 State Bank Commission, CSL Sec. 18, Blk. 4, H. & T. C. Sur.	Location.

(Continued on Page 281)

at 1,650-87 feet and 1,755-93 feet with 1,500 feet of oil in the hole. After a 120-quart shot at 1,650-1,793 feet the well was estimated good for 200 bbls.

Winkler County has a total of 85 operations this week. Ten are locations, five rigs, ten wells drilling less than 2,000 feet, nineteen below 2,000 feet, thirteen cementing or standardizing, twelve shut down, eleven making oil but not completed, two fishing and three wildcats.

Southern Crude Oil Purchasing Co. increased the output of No. 3 Hendrick T-67-C from 500 bbls. to more than 100 bbls. an hour by shooting it with 150 quarts from 2,950-3,025 feet. Total depth is 3,030 feet and it made 1,800 bbls. in the first 17 hours.

In Crockett County, Simmons Oil Co.'s No. 1 Halff, Section 69, Block L. I. & G. N. Survey, topped salt at 445 feet and was drilling at 545 feet.

WEST TEXAS COMPLETIONS

Crane County

Magnolia Petroleum Co.'s No. 12 O'Keefe-University flowed 550 bbls. after a 90-quart shot at 2,917-57 feet. The natural production of this well was 112 bbls. at 2,882-2,957 feet. Independent Oil & Gas Co.'s No. 4 University-A flowed 850 bbls. following a 20-quart shot at 2,875-95 feet. Top of pay was 2,800 feet and total depth 2,912 feet.

Tidal Oil Co.'s No. 4 University-I topped pay at 2,765 feet and was drilled to 2,900 feet. After a 200-quart shot at 2,775-2,875 feet it made 800 bbls. There was no production prior to the shot. Same company's No. 6 University-I swabbed 100 bbls. at 2,755-2,905 feet and increased to 400 bbls., flowing, when shot with 90 quarts at 2,895-2,905 feet.

Crockett County

Newman Oil Co.'s No. 1 B. C. Clark was abandoned as dry at 2,108 feet. It had a hole full of sulphur water at 2,106 feet.

Glasscock County

The California Co.'s No. 2 W. B. Currie was dry and abandoned at 1,630 feet.

Jones County

Stebbins Oil Co.'s No. 2 Higgs was a location abandoned. Stebbins Oil Co. and Sinclair Oil & Gas Co.'s No. 1 Scott was plugged and abandoned at 2,510 feet.

Pecos County

Douglas Oil Co.'s No. 1 Sellman was officially completed and plugged at 1,519 feet. Humble Oil & Refining Co.'s No. 3 Smith was completed flowing 355 bbls. an hour at 1,365-1,480 feet.

McMan Oil & Gas Co. and Marland Oil Co.'s No. 4 Yates flowed 106 bbls. an hour at 1,290-1,420 feet; No. 8 Yates flowed 115 bbls. an hour at 1,340-1,504 feet; No. 9 Yates flowed 100 bbls. an hour at 1,302-1,500 feet.

Mid-Kansas and Transcontinental's No. 9 Yates-B flowed 612 bbls. hourly through one 4-inch line from pay topped at 974 feet and drilled to 1,080 feet. Same companies' No. 3 Yates-C flowed 105 bbls. an hour at 1,030-1,150 feet. Roxana Petroleum Corp.'s No. 2 Tippett flowed 170 bbls. an hour at 1,350-1,517 feet.

Winkler County

Landreth Production Corp.'s and Roxana Petroleum Corp.'s No. 2 Grisham-Hunter in Section 45, Block 26, was officially completed at 2,817-2,947 feet. Initial production was estimated at 1,400 bbls., although both No. 1 and No. 2 on this lease flowed into the same tank.

Murchison Oil Co. and Cranfill Brothers' No. 1 Grisham-Hunter in the NW cor. NW SW Section 35, Block B-5, was recompleted at 2,726 feet flowing an estimated 454 bbls. Top of pay was 2,633 feet.

R. S. Mathews' No. 1 Cowden Cattle Co. was abandoned as dry at 4,100 feet.

Roxana Petroleum Corp. abandoned the location for No. 2 Ida Hendrick-B in the NW cor. S half SE Section 29, Block B-5.

Wichita Falls District

Field activities in the Wichita Falls district are rapidly increasing these days, especially in Wilbarger and Young Counties, and wildcatting is assuming larger proportions than at any time during the recent months.

Young County had one good well this week. Pitzer & West's No. 2 W. B. Hinson, in the Paul Pier Survey, offsetting Nash & Windfohr's No. 2 Hinson, flowed 550 bbls. at 2,200-05 feet. Their No. 4 Morrison-A, offsetting Nash & Windfohr's No. 1 Hinson, was estimated good for 150 bbls., flowing, at 2,224-29 feet.

There were two sales of producing properties that attracted attention during the week. Plains Production Co. sold to Barkley & Meadows its 80 acres in the Lyles Pool, south of Munkins in Archer County, for $40,000. This property is in the Belle Z. Lyles land, S. P. R. R. Survey, A-1,321, and has four producing wells making about 60 bbls. daily. The discovery well of the pool is on this lease.

Fain-McGaha Oil Co. and Roxana Petroleum Corp. continue to have bad luck with their Foard County discovery well. They plugged back from 2,550 to 1,494 feet and after working with the well for about three weeks finally had it making about 8 bbls. daily when they parted the 8-inch pipe in two places while trying to pick it up. It was set at 1,360 feet. They continued swabbing while waiting for fishing tools and promptly lost the swab in the hole, so they have quite a mess on their hands.

In Wilbarger County, E. B. Lawson of Nowata, Okla., has contracted to drill a 2,500-foot cable tool test in the north half of Section 18, Block 4, H. & T. C. Survey. He has also bought the SW of SE of Section 25, Block 4, H. & T. C. Survey, for $10,000 cash and the drilling of a well.

In Young County, the Paulle Oil Co. purchased the holdings of Coones & Hotchkiss.

Archer County

G. J. Brown's No. 2 Perkins and others was dry and abandoned at 1,797 feet. The Texas Company's No. 3 Jentach was dry and abandoned at 1,557 feet. Burns and The Texas Company's No. 1 Burns had an initial production of 15 bbls. of oil and 35 bbls. of water at 1,508-15 feet. Harris and associates' No. 1 Farmer was dry and abandoned at 1,538 feet. Hines and The Texas Company's No. 1 Farmer was dry and abandoned at 1,601 feet. McChesney's No. 5 Beardon was dry and abandoned at 1,091 feet. Pandem Oil Co.'s No. 10 Hudson made 12 bbls. initially from sand at 1,147-61 feet. Panhandle Refining Co.'s No. 1 Colgan was dry and abandoned at 1,494½ feet. Shaw's No. 1 Wilson was dry and abandoned at 1,600 feet.

Clay County

Carter, Fines and others' No. 1 Henderson was dry and abandoned at 910 feet.

Cooke County

D. Miller Co. and associates' No. 3 Koelzer made 10 bbls. initially from 1,364-94 feet. Oil Operators Trust Co.'s No. 7 Luke made 13 bbls. on the pump from 1,650-75 feet.

Jack County

Christie Brothers' No. 2 Jones estate made 142 bbls. of oil and 100 bbls. of water from 2,072-74 feet. Dale Oil Corp.'s No. 2 Hanna was dry and abandoned at 550 feet. W. H. Henderson's No. 1 Jackson was dry and abandoned at 704 feet. Keisser and Logan's No. 1 Clerihew was dry and abandoned at 1,000 feet. O'Neal and White and associates' No. 2 Street and others was dry and abandoned at 537 feet. Thedford Brothers' No. 4 Richard and Lanier made 4 bbls. initial on the pump at 505-20 feet.

Montague County

Arco Oil Co.'s No. 2 Loy and others made 15 bbls. the first 14 hours from 801-23 feet. Baker and McClure's No. 1 Hodge was temporarily abandoned at 1,109 feet. Bridwell and Heydrick's No. 3 Salmon A was dry and abandoned at 1,902 feet. Christie Brothers' No. 1 Eaton and others made 3 bbls. initial from sand at 756-93 feet. Continental Oil Co.'s No. 3 Hinton made 22 bbls. the first 20 hours from 766-802 feet. Humble Oil & Refining Co.'s No. 2 Hinton made 43 bbls. the first 11 hours from 783-89 feet. Little R. W. Oil Co.'s No. 1 Roper was dry and abandoned at 2,002 feet. The Texas Company's No. 1 Salmon-Henley made 16 bbls. the first 15 hours from 1,153-86 feet. Location was abandoned for The Texas Company's No. 5 Maddox B. Burns and Farris' No. 1 Field was dry and abandoned at 1,453 feet.

Wilbarger County

Humble Oil & Refining Co.'s No. 1 Castleberry A was plugged at 2,583 feet. Milham Corp.'s No. 1 Waggoner C made 18 bbls. the first 12 hours from 1,932-41 feet.

Wichita County

Ascot Co.'s No. 35 J. E. Roller was dry and abandoned at 1,318 feet. C. C. Bradford's No. 1 M. Reis was dry and abandoned at 2,051 feet. W. H. Hammon and associates' No. 1 S. H. McCarty C pumped 18 bbls. initially from 237-42 feet. Same operators' No. 2 T. F. Mitchell is a 15-bbl. well at 843-57 feet. C. P. Sheldon and associates' No. 2 J. M. Honaker made 20 bbls. initial from sand at 1,646-60½ feet. Stidham and Thrasher's No. 1 Martin was dry and abandoned at 1,907 fee.t

Young County

Carter, Fine and Carter's No. 1 Stewart was dry and abandoned at 840 feet. Gwynn's No. 2 Christian was dry and abandoned at 1,250 feet. Roamer's No. 1 McClutchey was dry and abandoned at 1,152 feet. Pitzer and West's No. 5 Mor-

(Continued on Page 284)

EDITORIAL

LET THE INDUSTRY DO IT

(Continued from Page 52)

of the oil industry would be conducted on the same insufficient scale.

He hears all this clamor about danger of the Government being left without oil for the national defense when he knows all Congress has to do is to buy and store enough oil from our present surplus to assure a supply for any conceivable war.

He notices that the Government, demanding conservation of oil, insists in its leases upon conditions that compel the most rapid drilling and production of oil from the public lands and the Indian lands.

Not even the twice-repeated efforts of the chairman of the Federal Oil Board, as Secretary of the Interior, could prevail upon Congress to approve a policy that would conserve the oil of the Osage Indians for future needs.

What hope, then, is there that government regulation of the entire oil industry would be any better?

The 23,000,000 motor car owners of the United States know that they owe their unfailing and cheap supply of motor fuel to the oil industry. Are they willing to risk the continuance of that supply to governmental direction which has so lamentably failed to function in every other attempt made to interfere with business or industry?

Late News from the Fields

OKLAHOMA

The Greater Seminole Field produced 429,577 bbls. for the 24 hours ending 7 a. m. Tuesday of this week. The pools produced as follows:

Little River	39,538
Bowlegs	123,157
Earlsboro	182,755
Seminole	58,455
Searight	25,672
Total, barrels	429,577

The Twin State Oil Co.'s No. 3 Hearn is the best well to be reported. It is flowing 55 bbls. an hour from the Wilcox sand found 4,351-61 feet. It is located NE cor. SE Section 2-9-5.

In the Bowlegs district, the Devonian Oil Co.'s No. 1 Gross, SW cor. NW NE Section 12-8-6 has 4,000 feet of oil in the hole from the Hunton lime found 4,580-4,610 feet. The Hunton is running low in this well.

The Barnsdall Oil Co.'s wildcat well in Section 14-8-5 which is so interesting at this time, has a bad hole at a depth of 4,095 feet, and the bailer will not go within 15 feet of the bottom. It has a showing of oil in the Hunton formation found at 4,085-90 feet. The Sylvan shale was topped at 4,090 feet, and it is still in this formation.

Harris & Haun's wildcat in Logan County, NE cor. SE Section 11-8-4w, flowed 175 bbls. in 20 hours with a hole full of cavings. This well has aroused much interest, and is producing from the Layton sand at 4,748-56 feet (corrected measurement). The owners may drill it on down to the Wilcox sand, as it was originally intended for a Wilcox test. The Wilcox sand in this well should be found around 6,100 feet, according to figures on wells in the vicinity.

LOUISIANA-ARKANSAS

SHREVEPORT, La., Nov. 29.—In the Champagnolle district of Union County, Arkansas, Garrett-Modisette Drilling Co. is about to complete an extension of proven area, 1½ miles southwest of Eddy Jones' No. 1 Crain which last week extended proven area three-eighths of a mile northwest of the Ohio Oil Co.'s producers in Section 1-17-14. The well, No. 1 Gregory in Section 10-17-14, is a little over 2 miles from the Ohio's wells on the Crain lease and with the bottom in 4 feet of sand at a total depth of 2,765 feet, swabbed 19 gravity oil with some salt water. Three-inch tubing will be run in an effort to make a small producer in this sand which apparently is the same as that found by Rovenger Oil Corp. in its No. 1 McCain, the discovery well.

Eddy Jones' No. 1 Crain, producing from the same horizon as the Ohio Oil Co.'s Crain wells and Magnolia Petroleum Co.'s No. 1 Carroll, flowed 1,190 bbls. in 16 hours Sunday at the end of which time it started making cut oil, 1 per cent water, 1 per cent sand and 22 per cent b.s. It was shut in again. A later analysis of the oil gives it as 31.2 gravity instead of 26.5 and the volume of gas has increased over the original estimate of 15,000,000 feet to 35,000,000 feet.

Dunn Safety Tubing Bleeder

Insures a clean dry job. Minimizes production time losses. Saves oil. Reduces the fire hazard. Improves working conditions. Increases the efficiency of the crew. Gets the well back on the pump in half the time usually consumed on a wet job.

Any size sent on approval.

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Many Wildcat Showings in Oklahoma

Seminole Registers Increase in Production as Result of Shooting Wells. Logan County Has Another Producer

By J. L. Dwyer
Staff Correspondent, Oklahoma Fields

The Greater Seminole Field of Oklahoma is growing to resemble Abie's Irish Rose and other institutions of similar perpetuity. One day last week the shooting program again placed the output at 436,000 bbls., the highest figure to be recorded in some time. Calculating futures at Seminole is a soul-trying work, and until the shooting has been completed, all estimates of future production are guesses of the wildest type.

With practically no completions during the past week, the output of the field has ranged from 419,000 to the figure mentioned above. The shooting increases, and at this time there are some 40 wells which are still to be shot. After that, Seminole may again decline, but until the torpedo wagon has been removed from the field there seems little chance for any drop.

As the brokerage houses state: "These statements are not guaranteed, but we believe them to be substantially correct."

The best well, and in fact the only good well to be completed in the field last week was the Barnsdall Oil Co.'s No. 3 Sango, SW cor. SW NW, Section 1-9-5, which had an initial production of 4,086 bbls. from the Wilcox sand found at 4,232-4,247 feet. The completion of this well brings the Barnsdall Oil Co.'s daily production in Greater Seminole close to 45,000 bbls.

The Carter Oil Co. is leading the field in output with 53,000 bbls., the Gypsy Oil Co. is second with 50,000 bbls., the Indian Territory Illuminating Oil Co. third with 47,000 bbls., and Barnsdall fourth with the above figure. It is possible that shooting of 12 wells may increase Barnsdall's production.

Pipe Line Runs

There is little change in the movement of oil out of the field. The daily average pipe line runs for the week ending November 27 shows:

Company—	Runs
Barnsdall	13,436
Mid-Continent Petroleum Corp.	6,580
Consolidated	1,982
Empire	16,714
Gulf	32,315
Magnolia	44,191
Oklahoma	68,292
Ozark	11,750
Prairie	70,418
Pure	5,405
Shaffer	12,177
Sinclair	51,979
The Texas Company	31,645
Tidal	8,446
White Oak	1,730
Total, barrels	377,062

Approximately 29,513 bbls. daily were put in storage for this period, and 13,043 bbls. shipped by tank cars.

The total quantity of oil stored in the Seminole area (not counting the working stocks of the crude purchasing companies) is now 15,776,069 bbls., with additional room for 3,689,931 bbls., and about 1,000,000 bbls. of storage under construction.

Wildcat Areas

A few interesting performances may be chalked up for some wildcat ventures around the state. In the Allen Field of Pontotoc County, the new well of W. R. Ramsey and others, No. 1 Smith, NW cor. NE Section 8-5-8, is reported to be flowing 1,000 bbls. daily from a deeper sand found at 2,602-14 feet. This is the farthest north well in the pool, and is a three-quarter mile extension of production. This well had a good showing in an upper sand, and will mean additional drilling on the north side of the pool. It also explodes the theory that no good production would be found north of the river, which is half a mile south of this well.

In western Oklahoma, a new wildcat well which is reported flowing from a sand thought to be the Layton, is Harris & Haun's No. 1 Hull, NE cor. SE, Section 11-18-4w, Logan County. This well is reported making a small flow every hour from sand 4,765-68½ feet, and is one of the most important wells in Oklahoma today. It establishes productivity in another part of Logan County.

In the Lovell Pool of the same county where oil is found in the Wilcox sand at a depth of "a mile and a half" there are five wells approaching the sand. The Roxana Petroleum Corp.'s No. 1 Stewart, SW cor. SW, Section 29-19-4w, has standardized tools at a depth of 5,802 feet. The sand in the original well drilled by the same company was found at 5,985 feet. There are five other wells drilling on the Roxana property in this field, and to paraphrase a popular advertising slogan, "four out of five have depth." Four wells are below 5,200 feet, and the fifth is drilling at 4,600 feet.

Osage County Showing

In Osage County, the newest development is a good showing in a wildcat well drilled by George Parker and others. It is No. 1, CSL NE, Section 22-25-7, and had the Burgess sand 2,660-63 feet. A pipe line is being laid to the well, and it will probably be several days before it is completed. This is the first good Burgess sand in this area.

A very important well in the south country, is the Carter Oil Co.'s No. 1 Phillips, NW cor. NE NW, Section 18-6-8. This well made a flow from the Woodford sand, and is believed to be the first well which ever flowed from that formation. The Woodford was found at 3,825 feet, and there is some question of the depth at which it passed out of this stratum. The Hunton lime was found at 3,933 feet, and the well is making small flows by heads.

Added to the list of wildcat ventures is Joe Lathrop and others' No. 1 Henn, SE cor. NE, Section 35-28-3w, in Grant County, 3 miles north of the Deer Creek Field. This well had sand 4,060-4,100 feet, and is making 7,000,000 feet of gas. It will probably be completed as a gas well.

The wildcat well of Snowden & McSweeney south of the Little River Pool in Section 13-7-6, which found the upper formations very high, is still shut down with a showing of oil in the Simpson sand. It will not be drilled in for the present according to advices from the field.

Production of Greater Seminole by Companies and Leases

Company and Farm—	Wells	Prod.
Seminole		
Carter:		
B. Carter	2	220
J. Carter	3	56
F. Carter	3	140
Creamer	2	36
R. Cudjo	4	440
W. Cudjo	2	10
Gilliland	2	360
Grisso, M.	1	...
Grisso, W.	6	1,060
Knapp	3	245
Killing, M.	12	8,400
Killing, G.	4	740
Lukes	7	1,700
Ponder	2	80
Simpson	3	125
Strother	4	625
Vierson	4	420
Jackson	1	...
Amerada:		
Fixico	4	1,058
Killing	4	498
Rentie	3	792
Atlantic:		
Cudjo, N.	3	650
Barnsdall:		
Carter	9	2,526
Henry	2	708
Jones	4	1,095
Empire:		
Gross	4	225
Wilson	2	384
Gypsy:		
Butler	3	510
Carter	8	570
Cudjo	5	670
Fixico	5	141
Harjo	3	1,000
Wolf	6	187
Independent:		
P. Fixico	3	330
Harjo	3	749
Independent and Garland:		
T. Fixico	8	908
Independent and Interocean:		
Jones	4	510
Indian Territory:		
Allen	2	355
Bowlegs	12	2,932
Fleet	1	10
Gooden	3	197
Harjo	4	100
James	4	17
Reed	3	15
Kingwood:		
Johnson	3	1,231
Magnolia:		
Born	1	12
Franks	4	678
Mid-Continent:		
Rentie	9	1,095
Tayeche	7	370
Mid-Kansas:		
Jacksey	1	...
Pressley	1	...
Wilkins	2	297
Phillips:		
Strothers	2	120
Philmack:		
Butler	3	1,230
Prairie:		
Gross	5	108
Mason	1	100
Spencer	1	13
Strother	8	965
Pure:		
Strother, A.	17	3,212
Strother, B.	5	2,397
Strother, C.	1	120
Roxana:		
Harber	2	285
Lashley	2	36
Sinclair:		
Carter	2	30
Cudjo, A.	6	975
Cudjo, B.	4	1,205
Dicey	2	1,775
Fixico	4	900
Slick:		
Cudjo	3	660
Franks	3	1,566
Giblet, Sam	3	2,584
Tiger	1	51
Superior:		
Cudjo	4	829
Texas:		
Mayhue	1	320
Strothers	2	75
Tidal:		
Carter	4	680
Fixico	6	610
Harjo, D.	3	735
Harjo, T.	6	240
Mahardy	2	215
Tayeche	1	3
Turman:		
Cudjo	4	1,111
Grisso	1	149
Jones	4	1,016
Total	321	59,794
Searight		
Carter:		
Davis	7	2,095
Frazier	6	4,930
Johnson	1	1,135
Kiker	1	30
Mandler	2	50
Scott	1	30

YATES POOL PRORATION PLAN, REVISED, TO BE CONTINUED

FORT WORTH, Tex., Nov. 28.—Continuation of the pipe line proration plan in the Yates Pool of Pecos County beyond the original trial term was approved at a meeting of the proration committee in Fort Worth last Friday. All of the companies operating in that area were represented at the meeting with the exception of the Gulf Production Co., which has never formally joined in the plan but which has to date drilled fewer wells and produced less oil in proportion to its proven acreage in the Yates Pool than any other company.

The basis of prorating pipe line capacity will probably be changed after the first of the year when the original trial term of three months comes to an end. The chief objection to the present system of dividing the field's 42,000 bbls. of outlet on the basis of so-called "potential production," obtained by gauging all wells once a month for a period of one hour, is that it causes much drilling of inside wells. Nearly all companies have already drilled more wells than they will need for the next six months, having built up an estimated potential of approximately 450,000 bbls. daily, based on the one-hour gauges. Production engineers who were present at Friday's meeting of the committee gave it as their opinion that the actual potential production of the field is probably less than half of the indicated potential, and some placed the figure as low as one-third. Even considering the lower figure, the Yates Pool could now produce 150,000 bbls. daily, which is more than the pipe line capacity will be six months from now, unless some plans for new outlets, unknown at present, are formulated quickly. The present drilling wells, too, can increase the actual potential production to 200,000 bbls. daily in all probability.

Curbing Drilling

With a view toward curbing this unnecessary drilling, which has been done by each company in order to increase its allotted portion of the pipe line space, the committee approved a plan to use as a basis for proration the proven productive acreage in the pool, rather than the estimated potential production. J. Elmer Thomas, Fort Worth, independent geologist and oil producer, has been selected to co-operate with the geological departments of the various companies in defining the present productive area of the pool.

This plan, of course, will have to be submitted to the officials of the companies involved, and will be finally approved or rejected at a later meeting. Naturally it has several inherent disadvantages, chief among which is the uncertainty of locating the outer limits of production where no wells have been drilled, but it also has its advantages and the committee feels that this plan will provide a more equitable basis for proration.

Subsurface data now available will allow a sufficiently close approximation of the productive area to be used as a starting basis, the committee feels, and this would be subject to revision every 15 or 30 days, similar to the present plan.

Chairman's Statement

The following statement was issued by W. A. Moncrief, vice president of the Marland Oil Co. of Texas, chairman of the proration committee, at the close of the meeting:

"Gossip has been recently current to the effect that the present plan of prorating the potential production to pipe line outlet in the Yates Pool is likely to be discontinued on account of the recent completion of a 6-inch line by the Gulf Production Co. from the pool to its loading rack at Rankin.

"On the contrary, the proration committee at today's meeting favored extending the proration principle beyond January 1, the date of expiration of the present agreement. Several additional bases of proration were discussed, the one most favorably received being a plan to prorate pipe line outlet on the basis of current productive acres.

"To this end, a competent consulting geologist has been employed by the executive committee to define the present productive area in collaboration with the respective geological departments of the operators involved."

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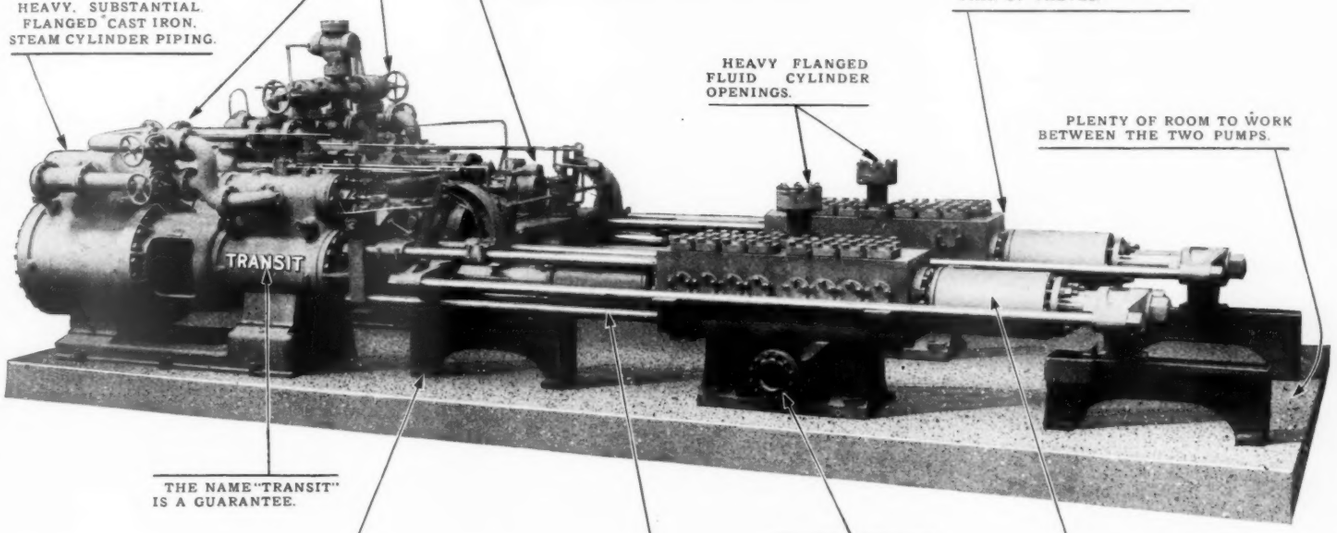
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SPECIAL ANALYSIS HEAT RESISTING STEEL FLUID END, MACHINED FROM A SOLID STEEL BILLET. NOTE LIBERAL NUMBER OF HAND HOLE PLATES FOR CLEANING CYLINDER, AND PLATES FOR INSPECTION AND REPAIR OF VALVES.
HEAVY, SUBSTANTIAL FLANGED CAST IRON STEAM CYLINDER PIPING.
HEAVY FLANGED FLUID CYLINDER OPENINGS.
PLENTY OF ROOM TO WORK BETWEEN THE TWO PUMPS.
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THE NAME "TRANSIT" IS A GUARANTEE.
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DISTRICT OFFICES
NEW YORK PHILADELPHIA PITTSBURGH
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Representatives

THE GLOBE SUPPLY & MACHINERY CO.
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Baltimore, Md.

REEVES & SKINNER MACHINERY CO.
St. Louis, Mo.

Amerada:		
Johnson	1	80
Strother	2	2,257
Gypsy:		
Cudjo	3	1,012
Mid-Continent:		
Grayson	6	790
Soloche	3	1,705
Pure:		
Lulla	1	...
Prairie:		
Cannon	1	10
Carter	1	30
Houck	1	7
Kincaid	5	85
Wiemer	1	15
Pure:		
Aldridge	5	4,200
Roxana:		
Strother	2	1,294
Sinclair:		
Polly	4	2,829
Twin State:		
Varnum	2	440
Wilcox:		
Chupco	7	4,501
Total	64	27,516
To.al Little River	73	42,995
Total Bowlegs	281	131,712
Total Earlsboro	271	174,642
Total Seminole	320	59,794
Total Searight	64	27,516
Grand total	1,069	436,659

Earlsboro

Amerada:		
Anderson	30	2,570
Cowden	8	2,350
Rodgers	2	710
Barnsdall:		
Brown	4	4,309
Bruner, F.	2	874
Bruner, N.	4	3,601
Cudjo, C.	1	31
Davis, D.	3	4,090
Davis, J.	3	3,794
Davis, M.	3	1,068
Gibson	7	3,712
Hearn	1	8
Ingram	7	9,088
Pack	4	539
Peter	4	388
Sango	2	583
Sebolka	1	1,452
Sullivan, H.	2	336
Sullivan, Harjo	3	74
Wasutke	4	1,108
Carter:		
Davis	1	1,395
Payne	3	1,185
Sango	3	8,840
Continental:		
Kays	2	1,305
Spencer	4	1,585
Crosbie:		
Bryant	2	685
Empire:		
Barker	1	3,532
Edmundson	3	1,871
Gypsy:		
Bruner	4	6,320
Carter	9	7,255
Earl	1	...
Hunick	1	567
McFarland	1	...
Noble	4	8,475
Peter	6	1,037
Sango	4	5,715
State	4	1,617
Strain	1	...
Independen.:		
Bruner	4	1,720
Sullivan	1	20
Knapp	5	4,222
Gaines	2	6,000
O'Dell	4	250
Inter-Ocean:		
Payne	1	...
Magnolia:		
Bryant	6	2,238
Cowden	4	20
Dixon	1	187
Edmundson	2	727
Holmsley	7	4,890
Ingram	1	15
Lena	3	135
Seay	5	1,936
Simpson	4	640
Sparks	7	7,303
Sullivan	2	1,463
Mid-Continent:		
McCumber	7	2,335
Mid-Kansas:		
Anderson	3	642
Phillips:		
Dunnaway	1	30
Graham	7	470
Prairie:		
Baker	1	100
Davis	4	1,735
Graham, C.	2	1,160
Graham, O.	4	4,160
Stidham	13	9,140
Shaffer:		
Clark	4	682
Roxana:		
Bayliss	1	17
Spencer	2	937
Sinclair:		
Foreman	1	15
Hollins	3	1,010
Sango	1	1,880
Skelly:		
Spencer	2	2,372
Texas:		
Anderson	5	1,582
Brown	7	1,877
Rodgers	3	6,445
Willmont	6	3,150
Tidal:		
Watkins	5	2,875
Twin State:		
Barker	4	95
Hearn	2	8,240
Total Earlsboro	271	174,642

Bowlegs

Amerada:		
Rasco	8	4,050
Atlantic:		
Baker	4	1,099
Fleet	4	867
Grayson	2	2,229
Jones, C.	3	163
Atlantic and Denver:		
Jones, A	2	418
Barnsdall:		
McNac	1	40
Murrow	4	1,268
Carter:		
Bowlegs	3	1,495
Burden	3	555
Harjoche	6	1,230
Hilly	2	1,390
Jones	3	4,595
McGeisey	1	...
Walker	2	4,201
Melisso	1	2,455
Wise	12	9,110
Empire:		
Lacy	6	845
Wise	2	1,542
Gypsy:		
Bowlegs	1	302
Bradley	1	115
Dosar	1	100
Brown	1	50
Cumsey	4	1,715
Grayson	4	3,527
Henderson	1	165
Jones	1	515
Walker	8	3,260
Wise	3	245
Independent-Marland:		
Coker	1	...
Indian Territory:		
Barnett	2	855
Billington	5	829
Bowlegs	11	1,373
Burden	1	22
Davis	4	2,825
Fay	6	4,665
Goforth	11	2,480
Hull	1	32
Livingston	11	6,201
Lizzie	2	1,221
Walker	8	1,405
Wilmont	4	1,673
Work	1	...
Youngblood	2	16
Magnolia:		
Davis	4	1,071
Hammond	2	206
McCulloch:		
Bowlegs	2	197
Mid-Continent:		
Baker	4	1,979
Bowlegs	1	205
Hoke	1	2
Smith	4	935
Minnehoma:		
Bowlegs	3	257
Prairie:		
Gahagan	4	1,605
Harber	3	3,820
Jones	2	2,785
Templeton	4	5,605
Whitney	4	135
Pure:		
Reed	15	6,595
Strothers "D"	3	1,146
Strothers "E"	1	5
Strothers "F"	2	983
Roxana and Houston:		
Taylor	6	1,577
Shaffer:		
Lacy	3	802
Sinclair:		
Bowlegs	1	95
Cumsey	2	5,085
Ellen	6	3,565
Harjo	3	1,570
Jones	6	6,745
Taylor	4	5,185
Walker	4	1,320
Texas:		
Reed	9	6,410
Tidal:		
Grayson	3	1,945
Harjoche	6	3,390
Twin State:		
Jones	2	130
Total Bowlegs	281	131,712

Little River

Amerada:		
Fore	1	845
Nitey	4	3,035
Blackwell:		
Nitey	8	5,760
Carter:		
Fish	1	750
Continental:		
Cosar	2	1,285
Gypsy:		
Campbell	2	936
Nungee	1	102
Pottey	1	1,167
Wadsworth	1	42
Independent:		
Harris	1	108
Indian Territory:		
Campbell	1	252
Dungan	3	4,040
House, M. A.	1	967
House, W. E., "A"	1	65
House, W. E., "B"	3	2,940
Jackson	3	3,309
McCulla	3	1,209
Nitey	5	2,732
Phoebe "A"	2	721
Phoebe "B"	2	984
Reed	1	241
Soketheche	4	1,443
Mid-Continent:		
Wadsworth	7	2,785
Smith	1	35
Philmack:		
Davis	1	1,365
Prairie:		
Dungan	1	...
House	4	2,985
Roxana:		
Smith	1	20
Superior:		
Wadsworth	1	37
Texas:		
Coker	3	1,060
Tidal:		
House	2	1,685
Johnson	1	90
Total	73	42,995

Carter County

Magnolia Petroleum Co.'s No. 1 R. James, NE cor. SW, Section 17-2s-2w, is drilling at 1,650 feet. McGahee and others' No. 1 Norris, SW cor. NW NE, Section 19-1s-2w, has been abandoned at 3,463 feet having a show of heavy oil.

Cleveland County

Magnolia Petroleum Co.'s No. 1 Lefevre, SE cor. SW Section 11-6-1w, lost the hole at 4,194 feet and was abandoned.

Creek County

Silurian Oil Co.'s No. 26 Simpson, NE cor. SE SW, Section 8-18-7, is rigging up to deepen from 2,495 feet. Empire Oil & Refining Co. has the rig up for No. 1 Barker Lee, SE cor. NW NW Section 36-15-7. Kennedy & Horner and others moved a machine to the location for No. 4 Tiger, CWL NW NW Section 25-18-11. Skelly Oil Co. and others' No. 1 Dickson, SE cor. NE Section 24-17-9, is a rig up. Ted Ray Oil Co.'s No. 2 S. Smiles, NW cor. NE NE Section 13-17-10, is spudding. L. & D. Oil Co. has the rig on the ground for No. 2 Townlot, SE cor. NE NE Section 23-17-10. Jackson & Wise moved the rig out for No. 4 Hendrickson, NE cor. SW NE NW, Section 21-16-9. C. G. Tibbens' No. 1 Lane, NW cor. Section 29-15-9, is an old well drilling deeper at 2,736 feet, the old depth being 2,340 feet. No. 2 Friday, NE cor. NW SW SE, Section 31-15-9, is a machine. Empire Gas & Fuel Co. has the rig on the ground for No. 1 Micco, SE cor. NW NW Section 18-14-10.

Olean Petroleum Co.'s No. 2-A Harjo, NW cor. NE SW, Section 13-17-8, was completed for 40 bbls. in sand at 2,754-76 feet. Alvard & West's No. 1 Tucker, SE cor. SW SW Section 14-17-8, gauged 10,000,000 feet of gas in sand at 2,755-64 feet. Ed Lee and others' No. 1 Unallotted, CWL NE NW Section 2-19-9, an old well deepened, made 5 bbls. after a shot in sand at 1,215-33 feet. Tom Kelly's No. 1 Thomason, SE cor. SW NW Section 35-18-10, made 50 bbls. after it was shot with 80 quarts in the Red Fork sand at 2,072-90 feet. Ted Ray Oil Co.'s No. 2 Smiles, NW cor. NE SW, Section 13-17-10, had the Dutcher sand at 2,474-97 feet, was shot with 40 quarts and made 30 bbls. Jackson & Wise's No. 3 Henderson, CSL NE NW, Section 21-16-9, had Dutcher sand at 3,000-14 feet and plugged back to 3,012 feet where it made 100 bbls. after the shot.

Coal County

Indian Territory Illuminating Oil Co. has the rig material on the ground for No. 1 Cook, SW cor. NW, Section 10-1-11.

Grady County

Oklahoma Gas Utilities is rigging up rotary tools for No. 7 Farwell, NW cor. SW, Section 26-5-8w. Marland Oil Co. is building the rig for No. 5 Burke, SW cor. NW, Section 16-3-5w, Carter-Knox Pool. Hamon & Cox's No. 4 Smith, NW cor. SW NW, Section 16-3-5w, is rigging up rotary tools. Garvin Drilling Co.'s No. 1 McCasland, NW cor. SE, Section 17-4-6w, has been completed for 10,000,000 feet of gas in sand at 1,858-71 feet. Carter Oil Co.'s No. 2 Hawkins, SW cor. Section 5-3-5w, is pumping 75 bbls. daily from 2,010-12 feet. Marland Oil Co. and Joe Ray's No. 1 Woods, NE cor. SE NE Section 17-3-5w, is pumping 15 bbls. from sand at 1,753-80 feet where the casing was ripped. No. 2 Woods, NW cor. SE NE, Section 17-3-5w, is pumping 20 bbls. from sand at 2,205-19 feet.

Grant County

Markham, Flannagan and others' No. 1 Sherrer, NE cor. SW Section 16-26-3w, is dry and abandoned at 5,369 feet.

Beckham County

Pease and others made location for No. 1 Pederson, NE cor. NW, Section 23-9-23w.

Haskell County

San Bois Gas Co.'s No. 1 Hurst, SW cor. NW SE Section 32-9-21, is drilling at 1,800 feet.

Kay County

Harris & Haun moved in a machine for No. 1 Miller, C SW SE, Section 20-29-1e, to drill for shallow gas. Greer, Walters and others are digging the cellar and pond for No. 2 Naylor, SW cor. NE, Section 31-28-1e. Harold Petroleum Co.'s No. 6 Case, CEL W half SE SW, Section 4-27-1w, is drilling at 2,450 feet.

Harris & Haun's No. 3 Henzel, NE cor. SW, Section 15-29-1w, is dry and abandoned at 1,677 feet. The Prairie Oil & Gas Co.'s No. 1 Pratt, NW cor. NE Section 30-27-1w, Blackwell area, had sand at 712-19 feet and made 94,000 feet of gas. Marland Oil Co.'s No. 1 Diller, NW cor. SE Section 12-26-2w, Hubbard Field, was deepened to 3,775 feet and plugged back to 3,618 feet and completed for 35 bbls.

LeFlore County

Le Flore Gas & Electric Co.'s No. 1, SW cor. NE Section 22-7-26, is drilling at 1,840 feet.

Logan County

Mid-Continent Petroleum Corp. is digging the cellar for No. 1 Poston, SE cor. NW Section 16-18-4w, Lovel area.

Muskogee County

D. L. T. Co. has a machine on the ground for No. 1 Mackey, NW cor. NE SW SW, Section 9-15-18. Tidal Oil Co.

(Continued on Page 265)

OIL SHOWING IN KANSAS WILDCAT NEAR POTWIN, BUTLER COUNTY

By J. L. Dwyer

Staff Correspondent, Kansas Fields

A showing in a wildcat well was reported when the Southbrook Oil Co.'s No. 1 Joseph, NE cor. SE NE Section 18-25-4, found some oil in sand at 2,148 feet. This well is 4 miles southwest of the city of Potwin, in Butler County. It should be drilled in this week.

The Roxana Petroleum Corp. has completed a water system for its operations in the Oxford district of Sumner County, and it has offered the water to the city of Oxford in case of emergency.

Butler County

Dixie Oil Co.'s No. 1 Albers, SE cor. SW NE Section 21-25-4, is spudding. Reeder and others' No. 1 Litchey, SE cor. Section 26-25-5, is dry and abandoned at 986 feet. Liggett and others' No. 4 Figge, SW cor. NE Section 36-27-6, has been abandoned at 2,828 feet.

Chautauqua County

Theta Oil Co.'s No. 1 Julian, C W half Section 12-32-10, had the Wilcox sand at 2,234-36 feet and plugged back to 2,028 feet where it made 15 bbls. after a shot.

Cowley County

Knex Drilling Co. is building the rig for No. 1 Matteson, C Lot 7, Block 44, Section 22-32-4, Winfield Pool. Roxana Petroleum Corp.'s No. 1 Harness, SW cor. NW, Section 19-31-3e, was completed for 75 bbls. after shooting 10 quarts in sand at 1,914-79 feet. The total depth is 1,984 feet.

Elk County

Willis and others' No. 1 Van Royer, NW cor. SE Section 34-29-12, is spudding. Conley & Winemiller's rig is up for No. 1 Donnell, NW cor. SW NW Section 12-30-9. Union Gas Corp.'s location was made for No. 1 Glasscock, C SW NE Section 11-31-10. Landon and others made location for No. 1 Mann, NE cor. Section 22-31-10.

Arkansas Fuel Oil Co.'s No. 1 Young, SE cor. NE Section 17-29-10, is a dry hole at 2,114 feet. Landon and others' No. 1 Willard, NW cor. NE NW Section 3-30-12, has been abandoned at 859 feet. Union Gas Corp.'s No. 1 Long, C SE NW, Section 11-31-10, is shut in for 750,000 feet of gas in sand at 1,111-22 feet.

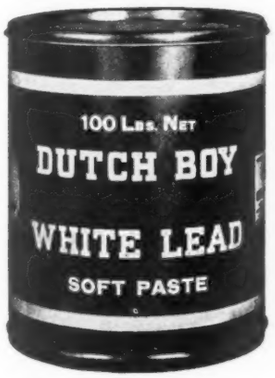
Greenwood County

The Prairie Oil & Gas Co.'s No. 1 Brown, NW cor. SW NW Section 11-22-10, is rigging. White Eagle Oil & Refining Co. made location for No. 1 Greenwood, SE cor. SW SW Section 30-22-11. The Prairie Oil & Gas Co. made location for No. 1 Schwab, SE cor. SW NE, Section 23-22-12.

Empire Oil & Refining Co.'s No. 2 Schwab, SE cor. NE NE Section 25-22-12, had sand at 1,696-1,720 feet, drilled on to 1,740 feet and made 200 bbls. after the shot. Braden, McClure and others' No. 3 Wengler, NE cor. SE, Section 22-22-13, made 40 bbls. from sand at 1,794-1,810 feet. La Rob Oil Co.'s No. 1 Wenzler, Lot 47n, Lamont Townsite, Section 30-22-13, is dry and abandoned at 1,775 feet.

McCullough and others' No. 1 Perrie,

(Continued on Page 265)



Dutch Boy soft paste white-lead is the same strictly pure white-lead that you always get under the Dutch Boy trade-mark—but instead of being a fairly stout paste, it is a soft paste. In other words, it has just enough additional linseed oil worked into it to eliminate the biggest part of the mixing job.

A NEW PASTE WHITE-LEAD

that thins to paint in a jiffy

From paste to paint with Dutch Boy soft paste white-lead is a matter of only a few minutes

PAINT buyers will instantly recognize the labor-saving advantages of this new Dutch Boy product.

Here is pure white-lead ready for almost instant use!

Now mixing costs are cut to nearly nothing. A hundred pounds of soft paste can actually be brought to brushing consistency in six or seven minutes—a rate of a gallon of paint a minute.

Easy to use

Heretofore white-lead has been sold only in the form of a fairly stout paste. The new form of Dutch Boy white-lead is a soft paste. In other words, into it has been ground an additional quantity of linseed oil. The result is a softer paste—one that reduces to paint with remarkable ease, eliminating the biggest part of the mixing-job. Formula: 85% pure white-lead; 15% pure linseed oil—*nothing else*.

All the user does is this: Stirs the paste quickly, *pours* it into a mixing bucket and adds flatting oil if a flat finish is wanted; and drier, linseed oil and turpentine if a gloss finish is desired. That's all there is to it. The pure white-lead paint is now ready for the brush.

Before you order your next consignment of paint materials, try out Dutch Boy soft paste white-lead. This new paste saves time and labor. And it gives a durable, economical white-lead paint — the kind which has been the standard for generations.

How sold

Packed in 100 lb. kegs, and in 50, 25, and 12½ lb. pails. Sold by the pound, 100 pounds bulking about 3½ gallons. Our nearest branch will be pleased to furnish additional information.

NATIONAL LEAD COMPANY

New York, 111 Broadway • Boston, 800 Albany Street • Buffalo, 116 Oak Street Chicago, 900 West 18th Street • Cincinnati, 659 Freeman Avenue • Cleveland, 820 West Superior Avenue • St. Louis, 722 Chestnut Street • San Francisco, 235 Montgomery St. Pittsburgh, National Lead & Oil Co. of Pa., 316 Fourth Avenue • Philadelphia, John T. Lewis & Bros. Co., 437 Chestnut Street

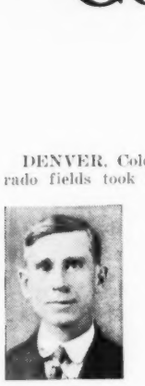
DUTCH BOY *Soft Paste* WHITE-LEAD

Colorado Fields Center of Interest

Production Believed Near in Wells Drilling in Logan and Jackson Counties. Good Oil Showing in New Mexico Well

By Tolbert R. Ingram
Staff Correspondent, Rocky Mountain Area

DENVER, Colo., Nov. 28.—The Colorado fields took precedence in point of interest over the other states in the Rocky Mountain area the last week owing to several favorable developments. The Continental Oil Co.'s No. 1 Hoye, on the South McCallum Dome in Jackson County, 7 miles southeast of its freak well making carbon-dioxide gas and high gravity oil, is making gas at 4,100 feet and officials have gone to the well in expectation of a completion. The gas is accompanied by oil showings and the prospects for a successful completion within the next few hundred feet are encouraging.



The Northeastern Colorado Oil Co.'s Willard Dome test in Logan County, has another dry sand at 5,310 feet, and drilling is continuing though its prospects are not so bright as they were. Ohio Oil Co. has shut in its gas well on the Hiawatha Dome and a short distance away the Reiter-Foster Oil Co. has a half-barrel show of 41 gravity green oil in a horizon above the gas sand. Midwest Refining Co. has commenced construction of a pipe line to handle its Iles Dome production.

Salt Creek, for the second successive week, failed to report any completions, and only wells reaching the pay were in the LaBarge district in southwestern Wyoming. The Texas Production Co. has a well at 830 feet that bailed 40 bbls., and the California Petroleum Corp. has two completions at shallow depths which have not yet been tested. The Buck Creek Oil Co. has four operations under way on the Ant Hills anticline in Niobrara County, where it recently brought in a wildcat, and negotiations are pending for another test on the Sheldon Dome in Fremont County.

In New Mexico the Getty Oil, Inc.'s No. 1 Hinkle, 10 miles southeast of the Artesia Pool, has a hole full of oil at 1,372 feet. The Texas Production Co.'s No. 1 Rhoades in southeastern Lea County, made 240 bbls. of 37.6 gravity oil in 50 hours. No completions were reported in New Mexico.

A new location has been made on the Cane Creek Dome in Utah, 450 feet down on the flank of the structure which will be drilled to test out the salt dome theory regarding those structures.

Colorado

The Northeastern Colorado Oil Co.'s No. 1 State, Section 36-8n-55, on the Willard Dome in Logan County, which was reported last week to have gone through what was believed to be the Muddy sand in the Dakota series at 5,207-30 feet, is now bottomed at 5,310 feet in hard white sand. Another thin sand of no consequence was cut just above the present horizon. Underreaming to lower the 4½-inch casing to bottom is in progress. The horizon first reported to be the Muddy sand was dry. Whether this interpretation of the log was correct is not certain. Two geologists representing major companies have been at the well. Harry Younkman, of the Empire Gas & Fuel Co., has been on the ground most of the time since drilling started and has taken samples of all cuttings. Henry Sherard, veteran geologist for the Prairie Oil & Gas Co., has been there for the last three weeks. Mr. Sherard is quoted as saying he believes the formation recently cut was not the first Dakota sand and, in fact, no sand at all, having shale all through it. He feels that the bit is now near the top of the first Dakota and that production is possible at any time. He advises that the test be continued even down to the Sundance.

The first of the several wells drilling in Jackson County to reach the objective Dakota probably will be the Continental Oil Co.'s No. 1 Hoye, Section 34-9n-78, on the South McCallum Dome, 9 miles southwest of the same company's discovery well on the North McCallum Dome, which is bottomed at 4,100 feet and underreaming the 8¼-inch casing. This test has already cut three horizons with good showings of oil and gas and looks encouraging. It is believed to be in close proximity to the first Dakota sand and important news from it may be expected at almost any time.

Not So Deep As Discovery Well

The last oil showing was at 3,940 feet. It is showing considerable gas at present depth. It is not expected to be as deep as the discovery well on the north structure as the two domes are divided by a fault with the downthrow on the north side. On the north structure the Continental's No. 1 Pollock, Section 2-9-79, is drilling at 3,850 feet, and No. 1 Peterson, Section 1-9-79, is drilling at 3,800 feet.

The two last named probably have 1,200 to 1,400 feet to go. The North Park Oil Co.'s No. 1 Goettler, Section 9-6n-82, on the Crosby Dray structure in Jackson County, a shallow test, encountered a showing in shale at 430 feet, at first the oil appearing as waxy substance similar to axle grease, but with additional drilling it turned to a green live oil in sufficient quantities to coat the tools. It is drilling at 470 feet and expects the Dakota within the next 300 to 500 feet. The Crude Oil Detector Co.'s No. 1 Hunter, Section 31-11n-79, in Jackson County, has resumed drilling at 3,504 feet following the completion of contract to carry it to 5,500 feet if necessary. The 8¼-inch casing has been landed at 3,500 feet.

In Moffat County, operations continue to progress slowly, though gradually wells are reaching horizons which give a better lineup on what may be expected from the several pools. The pipe line plans of the Midwest Refining Co. for handling its production from the Iles Dome were made public this week following a failure to reach an agreement with the Texas Production Co. for the joint use of existing lines.

The Midwest has a 4-inch line from Iles to Hamilton, a distance of 7 miles, and the Texas Production Co. has a 4-inch line from Hamilton to Craig, a distance of 16 miles. Up to this time the two companies have been using the two lines jointly. However, it is understood that the Texas company felt that a single joint line will not meet the future requirements of the Moffat and Iles Pools and that it was averse to mixing the crude from the two structures, the Moffat Dome crude being 41 gravity oil and that from Iles 31 gravity, the two not having the same base.

Midwest to Extend Line

The result was that the Midwest decided to extend its Iles-Hamilton line on into Craig, where it will erect one 55,000-bbl. steel tank and construct loading racks. Site for the racks and tank farm was purchased some time ago. That will give the Midwest a line of its own from Iles to Craig, while it leaves the Texas company with a line only from Hamilton (Moffat Dome) to Craig. It is probable that the Texas company will reach an agreement with the Midwest for the joint use of the Iles-Hamilton line, though it is possible that it will build its own transportation facilities.

In some quarters this failure to agree indicates a rival drilling campaign on the Iles Dome since the Texas company is in need of crude while the Midwest is anxious to curtail production, having all the crude it needs, the companies apparently being unable to get together on a drilling agreement.

Principal development on the Iles Dome for the week was in the Midwest Refining Co.'s No. 4-SD Shaw, NW NE, Section 27-4n-92, which came in with a flow of 5,000,000 feet of gas in the Morrison at 3,200 feet. This well is about one-fourth of a mile south of the discovery. With the gas was sufficient oil to color the derrick.

This well topped a gas horizon in the Morrison at 3,195-98 feet, the flow being about 1,000,000 feet a day. The casing was cemented at 3,199 feet, and the new gas commenced coming in as soon as the plug was drilled out. The well measures 38 feet higher on the structure than No. 18-SD on the NW SW, Section 23-4-92, which had 5,000,000 feet of gas in the Morrison and averaged 306 bbls. a day for the first week from the underlying Sundance sand, and 79 feet lower than No. 34-SD which is making 11,000,000 feet of gas from the Morrison and has not yet reached the Sundance. This condition makes it reasonably certain that oil will be found in the underlying Sundance.

The Midwest Refining Co.'s No. 34-SD Parkinson, SE SW, Section 22-4-92, is in sand and shale at 3,070 feet and making 11,000,000 feet of dry gas. It topped a sand in the Morrison at 3,052 feet and 2 feet into the sand was making 10,000,000 feet of gas last week. This well is 46 feet higher than the discovery, so a large producer in the Sundance is anticipated. The Texas Production Co.'s No. 17 Parkinson, NW SW, Section 23-4-92, which last week topped the Sundance at 3,500 feet and had 2,600 feet of oil standing in the 4½-inch casing from that horizon, at a total depth of 3,517 feet, when it commenced flowing 30 bbls. an hour from the Morrison between the 6¼ and 4½-inch casings, has been drilled one foot deeper into the sand and the oil in the 4½-inch casing rose to 2,750 feet. The well is flowing at present 450 bbls. a day from between casings. None of the other Iles Dome drilling wells are at an interesting stage.

Interest in Hiawatha Structure

Ranking with the Iles Dome development in interest is the operation on the Hiawatha structure in the northern area of Moffat County, near the Wyoming line, 60 miles northwest of Iles. The Reiter-Foster Oil Co.'s No. 1 State, SE cor., Section 16-12n-100, had a show of oil at 1,960 feet in a 15-foot sand. The show amounted to about half a barrel, the oil being of a darker green and testing 41 gravity. The importance of the showing lies in indication it gives that the structure will be oil bearing away from the heavy gas pressure on top. Since the discovery is above the big gas sand found in the Ohio's Kuykendall No. 1 and the Somir Petroleum Co.'s No. 1 Wilson on the top of the structure, it makes the possibility of that horizon very promising in the No. 1 State. The importance is further emphasized by the fact that the discoveries in all three wells are in what is believed to be the Wasatch formation of the Tertiary Age, which wildcatters for many years have passed up in the Rocky Mountain area as a possible producing horizon.

The Ohio Oil Co.'s No. 1 Kuykendall, NE SE, Section 22-12-100, which had a flow of 50,000,000 feet of gas from sand at 1,996-2,008 feet has been shut in after blowing for five days. The flow of gas decreased to 35,000,000 feet, with a rock pressure of 600 pounds. The company's intentions are to continue drilling if it can get through the gas horizon in search of oil in the Mesa Verde series. The Somir Petroleum Co.'s No. 1 Wilson, the discovery well, half a mile west of the Ohio's gasser, found what is supposed to be the same horizon at 2,220 feet and made 58,000,000 feet of gas on a test. It has since shown green oil around the fittings.

In Rio Blanco County, the Argo Oil Co.'s No. 1 on the NW NW SW, Section 9-2s-96, is building rig. This is to be another test of the Tertiary, including the Green River shale formation in which the oil shale is found. It is to be a 3,000-foot test, and the Midwest will have charge of the drilling. On the Rangely Dome, the two drilling tests are not showing much of interest. The Midwest Refining Co.'s No. 2 Rangely, Section 30-2-102, is still trying to control the gas in the Dakota so that it can drill on down to the Sundance, and at 3,091 feet is lubricating. The Texas Production Co.'s No. 2 Emerald, Section 31-2n-102, is drilling in lime at 3,850 feet. This test has been through the Dakota and into the Morrison where it had a heavy gas pressure. It was supposed to be in the Sundance at 3,815 feet, having been through a thick sand horizon showing 4,000,000 feet of gas and a little oil, but later it was considered doubtful if the Sundance had been reached.

Another Test Watched

Another Rio Blanco County test reaching an interesting stage is the Texas Production Co.'s No. 1 Freeman, Section 27-3n-94, on the Wilson Creek Dome, drilling at 5,030 feet in shale. Nothing was expected in this test under 5,300 to 5,600 feet outside of small shows of oil and gas, but it is now at a depth where something may take place at almost any time.

Interest has been aroused in a press association dispatch from Pueblo, Colo., quoting E. W. Marland as saying that the Marland Oil Co. of Colorado will start drilling operations on its extensive holdings in southeastern Colorado. Probable locations mentioned are on Section 8-30s-50, on the Freezeout structure in Baca County, and on the Johnny Creek structure, in Las Animas County, 9 miles northwest of the other location. It has been known that the Marland company had extensive holdings in that area but it was considered unlikely that any tests would be started this year. The offices of the company in Denver were without information concerning the reported program and were at a loss to account for the dispatch.

In Las Animas County, the Parker Club's No. 1 Adams, Section 32-34-56, near Branson, is reported drilling below 3,668 feet with 2,500 feet of water standing in the hole. The hole had gone through an 8-foot water sand and was 2½ feet into hard gray lime. The 6⅝-inch casing will be set to shut off the water.

Wyoming

Completions for the week in Wyoming were confined to the La Barge district in Sublet County, Salt Creek reporting none for two weeks in succession. The Texas Production Co.'s No. 1 Davis, Section 15-26-113, in the south end of the La Barge Field, made 40 bbls. in 24 hours in a swabbing test from a total depth of 830 feet. It will be put on the pump. This well was drilled to 590 feet where it had 2,000,000 feet of gas, and was ordered abandoned. It was then decided to drill deeper with the result that it will make an average producer.

The California Petroleum Corp.'s No.

5-F, Section 34-27-113, was completed at 854 feet and is being tested. Same company's No. 3-D, Section 3-26-113, was completed at 910 feet, but has not yet been tested. This company's operations appear to be slowing up for the winter. There were no new wells started during the week and its deep test, No. 7-G, Section 34-27-113, is shut down for the winter at around 4,800 feet. Minturn and others commenced spudding this week in their No. 1, Section 34-27-113.

The drilling wells of the Rainbow Oil Co. have suspended for the winter and the Superior Oil Co.'s well also is shut down. Beneficial Oil Co.'s No. 1 Frear, SW Section 5-29-111, in the Dry Piney district, is among the operations shut down until spring. It stopped drilling at 3,027 feet.

The way is being paved for another test on the Sheldon Dome, in Fremont County, where favorable showings of oil and gas were found in wells put down within the past few years, but where further exploration is said to have been held back by too heavy a burden of overriding royalties. The Mack Oil Co. drilled a well on Section 15-2n-2w, which had approximately 5,000,000 feet of gas in the Wall Creek series, of which there are eight sands on this structure, at a total depth of 2,800 feet. While drilling was suspended, the casing was left in the hole.

Previous to this test, the Marine Oil Co. drilled to 3,100 feet in its No. 1, Section 9-5-2, and had 5,000,000 feet of gas and 10 bbls. of oil in two of the upper sands, but found water in the third. This test was abandoned. The same company then went three-fourths of a mile to the northwest and drilled another well which was apparently off structure and abandoned at 3,445 feet.

Major Company May Drill Test

The logs of these wells give a much better lineup on the geology of the structure and it is probable that one of the major companies will undertake the new test. The Sheldom Domes lies between the Pilot Butte and Maverick Springs Fields, both being producers. The two producing structures are about 18 miles apart.

The Gose Oil Syndicate's No. 1, NE cor. NE Section 28-47-65, in the Thornton district in Weston County, in the northeastern part of the state, a deep test which was shut down several months ago and reported abandoned, has resumed drilling at 4,850 feet upon the advice of Dean E. Winchester of Denver, consulting geologist. A recheck of the geology indicated that it had not reached the sand in which production was hoped for. It will be carried down to 5,150 feet if necessary. The test is on what is known as the Soda Creek structure.

In Niobrara County, in eastern Wyoming, the Buck Creek Oil Co. has five operations under way, or getting started. Its No. 1 Delahoyde, NE Section 25-37-63, which has been working for several weeks to make a water shutoff in a sand below a sand that bailed 250 bbls. a day for a few days' test, is bottomed at 4,032 feet and has landed the 4¾-inch casing at 4,030 feet. Same company has made a location for No. 1 State, NE Section 36-37-63, and has the rig up. Its No. 1 Hattie Peterson, Section 30-36-62, is drilling at 575 feet with the 20-inch at 67 feet. No. 1 Peter Peterson, SW Section 30-36-62, is a location. These four wells are on the Ant Hills anticline located between the Lance Creek and Mule Creek Fields. The 250-bbl. show at 3,900 feet was believed to be in the Newcastle sand which means that the Dakota sands are yet to be tested. Its other operation in that county is its No. 1 Schuricht, NW Section 5-35-65, in the Lance Creek Field, which is drilling at 1,740 feet.

Ready to Drill In

In the Big Muddy Field in Converse County, the Continental Oil Co.'s No. 58 Whiteside, Section 9-33-76, is ready to drill in after changing from rotary to cable tools. It is bottomed at 3,054 feet with the 6⅝-inch casing on bottom. Same company's No. 54 Whiteside, Section 9-33-76, is on top of the Shannon sand at 880 feet.

C. B. Shaffer and associates, operating in the Warm Springs Field, just east of Thermopolis, have contracted for the sale of their output, amounting to around 200 bbls. a day, to J. H. Walden and associates who recently took over the old Alliance Oil & Refining Co.'s plant at Thermopolis. The plant has recently been overhauled and put into operation and it is understood that some experiments are being made with a new process for refining the black crude from the Warm Springs Field. Negotiations are reported pending for some light oil to mix with the heavy grade. The wells are being worked over and the pipe line put in shape to handle the crude during the winter when it has a tendency to congeal.

On the Garland structure in Big Horn County, the Utah Southern Oil Co.'s No. 3 Government, Section 29-56-97, is drilling below the Sundance at 2,344 feet with the Embar-Tensleep series as the next horizon from which anything of importance is expected. The Producers & Refiners' No. 3 Garland, Section 24-56-98, is underreaming to lower the 15½-inch casing at 1,080 feet.

In Fremont County, the Texas Production Co.'s No. 1 Alkali Butte, Section 1-33-95, developed a crooked hole at 35 feet. This has been one of the chief difficulties in testing that structure on account of the hard drilling. On the east side the dip of the structure is almost perpindicular.

A test has been started on the NE Section 15-44-64, in Weston County, by unidentified parties, on what is known as the Howard structure. The hole is down about 400 feet. The location is 18 miles west of Newcastle.

In the Oregon Basin Field in Park County, there are now 19 locations in various stages of drilling. About half of them are shut down and nothing of importance is expected from the others for some time as they are not yet deep enough to disclose any particular information.

New Mexico

A good showing in Getty Oil Co., Inc.'s No. 1 Hinkle, NE NE NE Section 23-20-29, in Eddy County, attracted attention this week and resulted in some trading in leases. The test is in what is known as the Twin Hills district, about 10 miles southeast of the nearest producer in the Artesia Pool. It encountered the first showing at 1,365 feet and drilling was suspended at 1,372 feet waiting for orders. The hole was full of oil when operations ceased and made several small flows by heads amounting to 35 bbls. in two days. It topped the salt at 350 feet and passed out of that formation at 1,010 feet. It had a show of gas at 1,205 feet.

The well is located 500 feet south of the same company's No. 1 Rawson in the SE cor. Section 14-20-29, which recently was abandoned on account of bad hole. The No. 1 Rawson well was drilled to 1,670 feet when the tools were lost and the hole went crooked. It had a show of oil at approximately the same horizon as in the new well. It was plugged back to 1,390 feet and shot with two charges of 10 and 30 quarts at 1,372 feet. There was a show of oil and 250 feet of water in the hole when cleaned out, but no production. The rig was then skidded 500 feet to the south and No. 1 Hinkle started. The oil in No. 1 Hinkle is about 20 gravity. A pumping test will be made at this horizon.

The showing in the Hinkle well, which was sufficiently shallow to make a comparative small producer attractive, has served to stimulate interest in the southeastern New Mexico area which already was being revived by the results in the Texas Production Co.'s No. 1 Rhoades in Lea County, which made 120 bbls. of oil with 23,000,000 feet of gas when it was tested after a separator had been installed. The operators are expecting a big play in that territory next spring. Extensive wildcatting by the major companies is not anticipated, however, until after Seminole has passed out of the scene as a disturbing factor, though the smaller companies will find its possibilities attractive in the meantime.

Influx of Wildcatters Suspected

There is a large expanse of territory in southeastern New Mexico, and while a number of the major companies already are well fortified with acreage, there are many small blocks available. Prices are so much lower than in the older fields of Oklahoma, and the conditions are so promising, that an influx of wildcatters is looked upon as a certainty. One operator points out that every well drilled at this stage will be of value for the information its log will yield. It may require a good many wells to develop the trend of the folding and the subsurface conditions before the pool which many believe to be present in that area is located.

The Rhoades well is shut in and will not be produced except to furnish fuel for other operations. The location of this well is in SE NW NW Section 22-26-37. Another well will be drilled in the same zone at once, but location has not yet been announced. One of the most interesting features of the discovery is the high quality of the oil which tested 37.6 gravity compared with 20 gravity for the oil in the Hinkle well. The Rhoades well was on production for 50 hours in which time it put 240 bbls. into the tank.

Other Lea County tests reveal no very important developments for the week. The Maljamar Oil & Gas Co.'s No. 2 Beardsley, SE SE Section 15-17-32, which had a show of 100,000 feet of gas in red sandy shale at 3,247-52 feet, is drilling in lime at 3,610 feet. A show of oil or gas is expected at almost any time, but nothing of great importance is anticipated until a depth of around 3,800 feet is reached.

Inglefield & Bridges' No. 1 State, Section 4-17-34, which ran into a little salt water, 6 bbls. a day, at 5,313 feet, is bottomed at 5,329 feet, and probably will be abandoned. When left standing, the fluid rises 4,000 feet in the hole and it is thought that it would make 12 to 15 bbls. a day, but this is hardly commercial at that depth. Before abandoning it, however, it is expected that it will be given several shots at between 4,700 and 4,900 feet.

Midwest Refining Co.'s No. 1 State, NE Section 9-19-38, is drilling in red shale at 560 feet, and Bordages' No. 1 Hughes, Section 27-19-38, is drilling below 500 feet. Texas Production Co.'s No. 1 Lockhart, SE SW Section 5-22-38, is drilling at 4,390 feet in gray lime after finishing up a fishing job. It had some rainbow colors at 4,326-32 feet, but otherwise, there have been no encouraging signs.

Lost Tools Cause Trouble

In Eddy County, the Pueblo Oil Co.'s No. 1 Gessert, NW NE Section 1-17-31, is still having trouble with lost tools which were blown 30 feet up to the hole when gas was encountered at 3,705 feet. Sidetracking has been in progress, but it may have to go back and start all over again. This is a disappointment as the test was reaching a very interesting stage and it may be some time before any new depth is made.

R. D. Compton's No. 4 Mann, SW NW Section 4-18-27, set the 10-inch at 1,118 feet, but failed to get a shutoff and at 1,150 feet the hole was standing full of water. The 10-inch will be lowered to make a shutoff. The total depth is 1,156 feet. Empire Gas & Fuel Co.'s No. 4-A Russell, SW SE Section 35-17-27, is drilling at 1,440 feet. The Pueblo Oil Co.'s No. 2 Yates, Section 33-17-28, was shot with 100 quarts at 2,254-60 feet, but the quantity of oil did not show any material increase. It probably will make a 10-bbl. pumper. It probably will be shot again at 2,145-53 feet before being completed. The total depth drilled was 2,306 feet. Levers & Carper's No. 5 State, Section 3-18-28, is drilling below 1,160 feet. Texas Production Co.'s No. 2 Robinson, NW SW Section 25-16-31, has cleaned up a fishing job and is drilling in lime at 3,692 feet. It is drawing near the gas horizon encountered in No. 1 Robinson at 3,885 feet.

In Curry County, Arena Oil Co.'s No. 1, NE Section 18-13-31, is reported to have been taken over by the Manhattan Oil Co., which company will complete it. The hole is bottomed at 780 feet. The Etz, De Vito and others' No. 1, NW SE Section 24-11-25, has been abandoned at 1,250 feet. McQuigg & McQuigg's No. 1

(Continued on Page 240)

PLAN NEW DRILLING IN SKIFF FIELD; DEVENISH WELL FINISHED AT 3,090 FEET

By Victor Lauriston

Staff Correspondent, Canadian Fields

CHATHAM, Ontario, Nov. 26.—In the Skiff Field, southern Alberta, Devenish

Petroleum's No. 1, LSD 5, Section 27-5-14w4, is being finished at the original production level of 3,090 feet, after drilling to the top of the Madison limestone at 3,160 feet. The string of 8¼-inch casing has been raised to a point just above the first producing oil sand, and the water below cemented off. The camp at Devenish Petroleum's No. 1 is being temporarily colsed, pending a start on new drilling. At the 3,090-foot level the well was good for around 250 bbls. a day of heavy crude, testing around 22 Baume, and some shipments were made earlier in the year to the Imperial Oil, Ltd., refinery at Calgary. Shipments will not be resumed immediately, as it is planned to use the heavy crude production for fuel in drilling later wells. Under an arrangement made some weeks ago between Devenish Petroleum, Ltd., and Imperial Oil, Ltd., the latter company will carry on extensive development work on the Devenish acreage, drilling some 10 wells. It is understood that the first new drilling will be located a little west of Devenish No. 1, and that probably several wells will be drilled simultaneously.

Turner Valley

In the Turner Valley Field, the deep producers from the Madison limestone seem to be slightly increasing their production with the approach of colder weather. Royalite Oil Co.'s No. 4, LSD 12, Section 7-20-2w5, showed a marked increase for October over the previous month, as well as over October of last year. Illinois-Alberta Oil & Refining Co.'s No. 1, LSD 14, Section 12-20-3w5, which was making around 85 bbls. a day in the summer, has gone up to 107 bbls., maintaining this average for more than a week. Vulcan Oils' No. 1, LSD 11, Section 13-20-3w5, which recently resumed production after being frozen for over five weeks, is averaging around 110 bbls. a day, as compared with a top production of around 100 bbls. a day before the freeze-up.

Illinois-Alberta's No. 2, LSD 14, Section 12-20-3w5, is drilling at 678 feet with the diamond drill outfit. Vulcan Oils' No. 2, LSD 11, Section 13-20-3w5, has resumed drilling after a week's delay attempting to recover the lost tools from No. 1 while it was frozen. No. 2 resumed at 3,850 feet; some 130 bbls. of seepage oil was bailed from the hole before resuming drilling.

Stockmen Oils' No. 1, LSD 1-2, Section 27-20-3w5, in the north end of the Turner Valley, is being finished as a gasser. This test was originally carried to around 5,400 feet. Owing to drilling difficulties, it has to go back to around 4,400 feet and carried what was practically a new hole to 4,550 feet. At this depth drilling was discontinued and the well is being pulled back to the shallow wet gas horizon at 1,760 feet, where a daily production of approximately 3,000,000 feet was secured. Arrangements have been made for the sale of some of this gas for power purposes, which may make

(Continued on Page 259)

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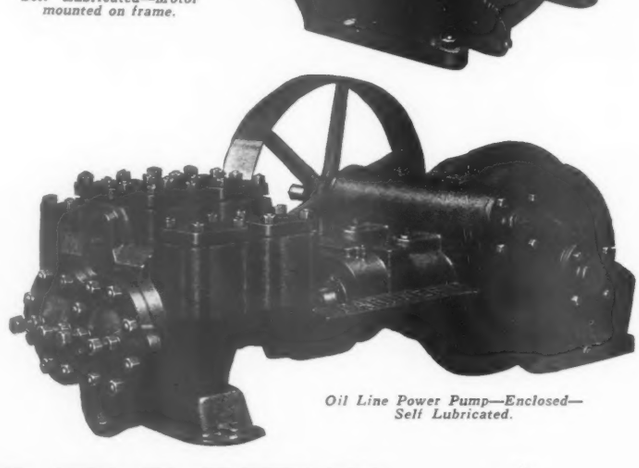

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Good Gasser Completed in New Field

Houston Oil Co.'s 50,000,000-Foot Well in Mirando District, Southwest Texas, Makes Territory Look Promising

By B. D. Stevenson
Staff Correspondent, Southwest Texas

SAN ANTONIO, Tex., Nov. 28.—Houston Oil got a 50,000,000-foot gas well in the Mirando district of Southwest Texas, Magnolia got a 50-bbl. well at Luling and Mid-Kansas got a 10,000,000-foot gasser in Medina County, all of them prosaic except the Houston Oil Co.'s gas well on a Roxana lease in Block 48 of Survey 10 of the A. M. Bruni Subdivision of the Mariano Arispe grant. This is south of the town of Bruni and west of the Cole gas field in a new territory that is being developed to gas. This is the third well and is at 2,349 feet with a rock pressure of 780 pounds. Killam got a well some months ago close to the town of Bruni at about the same depth. It looks as though it will be a promising gas territory and in a deeper sand than is producing in the Cole Field.

The Killam well (Mims & Evans) in Survey 10, Block 16, just north of the Mirando Valley Pool which last week looked as if it had a chance to pick up production and help fill up the gas between that pool on the south and the Bruni extension of the Aviator Pool on the north, is a disappointment and has been abandoned at 1,540 feet, but O. W. Killam has located his No. 1 Benavides 600 feet southwest of the Mims & Evans test and will make an effort to pick up the line of production. Killam's No. 3 Bruni in Survey 585, a little west of where O'Hern & Seacord discovered gas and oil in Duval, has abandoned his test at 1,827 feet. Killam's test was over the line in Webb County and at the depth of first production in the O'Hern & Seacord Pool. It had oil and gas, but also plenty of salt water to make it a failure.

Houston Oil Co. is moving a rig to the Cuellar tract north of the town of Bruni on a Humble lease and will try to extend north the gas area it has helped to extend south by the well at brought in last week.

Humble at Piedras Pintas made a test of the No. 7 Walsh at 3,821 feet and is drilling deeper. It is on the Piedras Pintas salt dome in Duval County.

In the Kingsville Field the Humble's No. 1 Kivlin reported last week as coming back and with a gas pressure built up to 400 pounds has continued to improve and at last reports had built up a gas pressure of over 600 pounds. Humble has made a location for the No. A-4 Dennett in that field, 400 feet south of the No. A-2 Dennett in Lot 1, Section 39, of the field and south of the best four producers of the field.

Duval County

Houston Oil Co.'s No. A-2 Bruni, Survey 10, Block 48, Cole Field at 2,349 feet, gauged 50,000,000 feet with rock pressure of 780 pounds.

O. W. Killam's No. 3 Bruni, Survey 585, south of the Cole Field and the O'Hern & Seacord wells at 1,827 feet has been abandoned.

Cole Petroleum Co.'s No. 50 Benavides, Cole Field, at 2,170 feet has been abandoned.

Schlessinger Oil Corp.'s No. 1-A Moody, Survey 60, wildcat well, has been abandoned at 3,006 feet.

Zapata County

Ed Mims and San Evans' No. 1 Hinnant, Survey 10, Block 16, Mirando Valley Pool, has been abandoned dry at 1,540 feet.

New Locations

Cole Petroleum Co.'s No. 50-A Benavides, Survey 5, Block 7, Cole Pool in Duval County, has been spudded in 625 feet to northeast and 650 feet to northwest lines.

Houston Oil Co. (Humble) No. 1 Juan V. Cuellar, Share 1, Cuellar grant, 3,300 feet to southwest lines and 2,324 feet to southeast lines, is moving on.

O. W. Killam's No. 1 Benavides, Survey 12, Block 13, Mirando Valley Pool, Zapata County, is drilling at 500 feet.

Caldwell County

Magnolia Petroleum Co.'s No. 19 R'os, Luling Field, John Henry Survey, at 2,126 feet is a 50-bbl. well.

Medina County

Mid-Kansas Oil & Gas Co.'s No. 2 Nixon, Survey 13 3-4, Adams gas field at 946 feet in sand topped at 934 feet gauged 10,000,000 feet daily.

Gonzales County

The Texas Company's Nos. 2 and 3 Plowman, Byrd Lockhart Survey, both core tests have been abandoned at approximately 1,200 feet.

Kleberg County

Humble Oil & Refining Co.'s No. 2 Sexauer, Section 41, Block 11, Kingsville Field, has been abandoned dry at 3,770 feet.

Live Oak County

Morgan-Roxana's No. 1 West, Survey 2, abandoned at 2,207 feet with slight gas showing at 1,761 feet.

McMullen County

George Pickett's No. 1 Jacob, Survey 7, north of the Calliham Field, has rig moved off at 3,030 feet with pipe still in ground and will ultimately move back and deepen.

Val Verde County

Douglas Oil Co.'s No. 1 Sellers, Section 82, Block A, has been abandoned at 4,192 feet with hole full of salt water .

Bastrop County

Fred Adams' No. 1 E. E. Roberts, J. B. Blalock Survey, has been abandoned at 2,395 feet with Edwards topped at 2,345 feet.

New Locations

Schimmel Production Co.'s No. 14 Koehler, Survey 39, Bexar County, Somerset Field, is location 608 feet east of No. 9; No. 15 Kohler, same survey and field, is location 795 feet to north and 250 feet to south line.

Karnes and others are making location in Frio County, 14 miles southwest of Moore for a well.

Williams & Phalon's No. 1 Cervenks has machinery on ground in the Williams Creek section in Fayette County.

Humble Oil & Refining Co.'s No. A-4 Dennett, Lot 1, Section 39, Kleberg Town & Improvement Co. Survey is location in Kleberg County, 550 feet to north line and 150 feet to west line.

Chacon Oil Co.'s No. 2 Jungman, Medina County is drilling at 100 feet.

Groneman & Wilder's No. 1 Hithmeyer is location in Milam County, 2 miles south of the Thrall Field.

Coffield & Hale's No. 1 Isaacs is location in the T. J. Chambers Survey in Milam County in the northwest corner.

Saxet Oil Co.'s No. 10 Rachal, San Patricio County has set 400 feet of 10-inch surface casing; No. 2 White Point Development Co. has also set 400 feet of 10-inch surface casing.

Mission Drilling Co.'s No. 1 Morris, San Patricio County, has derrick up.

Cole Gas Field—Duval

O. W. Killam's No. 8 R. Benavides, Survey 11, Block 6, located 585 feet to northwest and 150 feet to southwest lines, is coring at 3,797 feet; No. 3 Bruni, Survey 585, located 2,140 feet to east and 150 feet to north lines, is drilling at 1,780 feet. Houston Oil Co. (Roxana) No. A-2 Bruni, Survey 10, Block 48, located 200 feet to northwest and 150 feet to northeast lines, has set casing at 2,334 feet after testing gas at 2,342-49 feet. Houston Oil Co. (Sun) No. C-2 Benavides, corner of Blocks 7, 8, 61, 62, is drilling at 985 feet. Cole Petroleum Co.'s No. 50 Benavides, Survey 5, Block 7, had sand at 1,942 feet, tested dry and is now fishing at 2,190 feet.

Piedras Pintas Dome

Humble Oil & Refining Co.'s No. 7 Walsh, Survey 185, located 2,050 feet to east and 1,750 feet to north line, at 3,821-25 feet bailed dry and will take one more core and then break down 4-inch drill stem and resume drilling with 3-inch.

Randado Field—Jim Hogg

Magnolia Petroleum Co.'s No. 32 Merchants State Bank, Survey 415, is skidding derrick over from last well. Houston Gulf Gas Co.'s No. 14 Palacious is location.

Schott Pool—Webb

Magnolia Petroleum Co.'s No. 11 Garcia, Survey 58, is location.

Aviator or Bruni Tracts

F. J. Bates' No. 1 Bruni, Block 47, located 150 feet to south and east lines, has derrick up and is moving on. Colon Schott's No. 1 Bruni, Survey 835, Block 3, located 900 feet to east and 150 feet to south line, has been spudded in.

Carolina-Texas Pool

D. J. Simmons' No. 2 De la Garza, Survey 335, Block 8, is standing at 400 feet. Houston Oil Co.'s No. 3 S. Benavides, Survey 683, located 350 feet to north and 1,470 feet to east line, has sand at 3,003-08 feet and testing.

Cole Field No. 2

Cole Petroleum Co.'s No. 36 Benavides, Survey 412, Block 14, located 159 feet to east line and 266 feet to north line, is drilling at 5,495 feet.

Mirando Valley—Zapata

Ed Mims and San Evans' No. 1 Hinnant, Survey 10, Block 16, located 150 feet to southeast and southwest lines, at 1,538 feet tested little oil and salt water, breaking bridge out of hole. O. W. Killam's No. 1 Lopez, Survey 75, Block 16, located 200 feet to south and 700 feet to east lines, is drilling at 1,500 feet.

Luling Field—Caldwell

North & South's No. 1 Kelly is drilling at 7,268 feet in schist; No. 2 Tiller is also drilling in schist at 6,815 feet.

Dale Field

The Texas Company's No. 4 Lackey, Nich Kelly Survey, 545 feet southeast of No. 1, is in chalk at 2,275 feet with little oil; No. 4 Clingensmith, Squire Damon Survey, 545 feet to southeast and 150 feet to southwest lines, at 2,341 feet is 150 feet of oil in hole and bailing; No. 7 Clingensmith, Squire Damon Survey, 150 feet to southeast corner, is drilling at 1,200 feet.

Adams Gas Field—Medina

C. E. Lange and Jake Jarmon's No. 1 Adams, Survey 71, located 500 feet to north and west lines, at 60 feet is changing from spudder to rotary rig. Pioneer Oil & Refining Co.'s No. 1 Adams, Survey 13, Block 1, located 300 feet to south and east lines, is drilling at 300 feet. Southern Gas Utilities' No. 3 Schmidt, Survey 71, located 1,447 feet to west and 1,340 feet to south line, is drilling at 225 feet. Witherspoon Oil Co.'s No. 6 Nixon, Survey 119, located 2,750 feet to north line, at 260 feet gas blew out and caught fire and burned down rig. Well had fresh water at 160 feet.

Refugio Gas Field—Refugio

Coast Gas Co.'s No. 2 Shelly is rigging up. Houston Oil Co.'s No. 5 Fanny Heard set casing at 2,592 feet with oil and gas showing at 2,495-2,505 feet with test also a producing gas well in shallower sand and is now deepening to 3,300-foot sand; No. 8 W. J. Heard is rigging up to deepen to new deep sand producing well from a shallower sand; No. 1 Smith Heard is rigging up to deepen to 3,300-foot sand; No. 11 W. J. Heard, Refugio Survey, 508 feet northeast of No. 10, at 2,230 feet set screen and bailed dry and will pull liner and rest and test again; No. 2-A Rooke is drilling at 2,600 feet. Houston Gulf Gas Co.'s No. 1 Vance, a gas well in shallower sand, is rigging up to deepen to 3,300-foot sand; No. 3 Heard has set 10-inch casing at 400 feet; No. 4 Heard is drilling at 2,010 feet.

SCHLESSINGER WILDCAT DRILLED TO CONTRACT DEPTH, ABANDONED

By B. D. Stevenson

SAN ANTONIO, Tex., Nov. 28.—Schlessinger Oil Corp.'s No. 1-A Moody in northwestern Duval County, up the Reynosa escarpment 25 miles from the Carolina-Texas Pool in Webb County, has been completed to the contract depth of 3,006 feet and abandoned. It looked several times as though it might make a well and open a pool there. It made a small amount of oil at 2,396-2,401 feet and again some more at 2,437-46 feet. It had enough oil to convince many persons that there is "oil somewhere" around there, but it failed to make a commercial producer. No announcement has been made of additional drilling yet.

The O. O. Owens well on the Mills ranch in northwestern Val Verde County has made more hole, being now at 3,198 feet and has more gas than it had and is in lime and sand and is still drilling.

In wildcat activity there is a renewal of operations in Starr County. Southern Exploration Co. which has an enormous lease and has been shut down for months, has moved off the gasoline rig and is moving in heavy duty machinery and will start up. The Texas Company has an interest in the leases.

In Maverick County Rycade is still tied up on its deepest two wells, the No. 1 Chittim and No. 2 Sullivan, each a mile deep and is changing to a rotary rig on the Sullivan test. It has made more hole in the Chittim No. 2 and is now down 2,560 feet. Harsten is resuming drilling in Starr County and the McCarley well is also to resume drilling.

Brooks County

The Texas Company's No. 3 Lasater, Survey 329, located 2,380 feet to north and 450 feet to west lines, is drilling at 4,571 feet in hard sand.

Duval County

Driscoll and others' No. 5 Driscoll, Survey 23, located 1,000 feet to south and 550 to west line, at 2,469 feet on drill stem test failed to make a test, gas mudded off several days ago on account of part in casing, and fear is that test will be lost. Schlessinger Oil Corp's No. 1-A Moody, Survey 60, located 155 feet to north and 1,650 feet to east line, at 2,437-46 feet tested 24 fourbles fluid, first 14 fourbles 50 per cent oil and remainder mostly salt water with some gas and is now drilling at 2,635 feet. National Oil Co.'s No. 1 Ball, Survey 16,

(Continued on Page 261)

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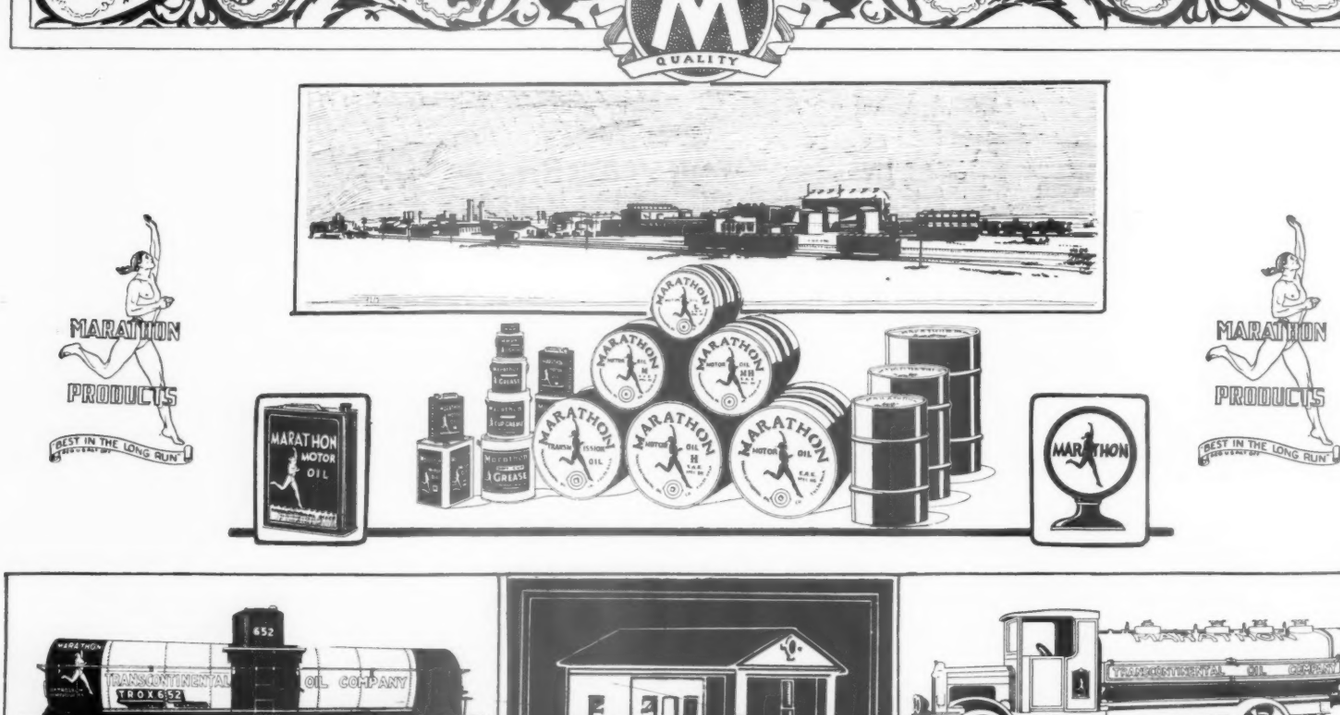


Spindletop Wells Feature Gulf Coast

Pierce Junction, One of Most Active Spots, Shows Gain of 3,000 Bbls. Hull Field Maintains Activity

By Neil Williams
Staff Correspondent, Gulf Coast Fields

HOUSTON, Tex., Nov. 28.—Three new wells in the famous Spindletop Field the past week added more than 5,400 bbls. of initial production to that pool and featured Gulf Coast operations. Otherwise, developments in Coastal territory were of little importance with most of the new activity being confined to old wells being worked over and deepened. The principal well in Spindletop and also the largest which has been completed in Coastal territory in several weeks was Yount Lee Oil Co.'s No. 47 McFadden, which came in flowing at the rate of 4,000 bbls. daily of pipe line oil. Production is from one of the shallower sands at a total depth of 2,781 feet.

Yount Lee Oil Co. also got another good producer at Spindletop in No. 10 McFadden, which came in flowing 1,000 bbls. daily after being deepened from 2,811 feet to 4,817 feet. Gulf Production Co. completed the trio of wells in its No. 16-A Marrs-McLean which started flowing 458 bbls. daily from a sand at a total depth of 4,677 feet. Another Spindletop well completed by Yount Lee Oil Co. came in a gasser at 4,800 feet with a rock pressure of 675 pounds.

Spindletop in Jefferson County and Pierce Junction in Harris County have been vieing with each other in good wells being completed, the latter being one of the most active spots in the district, although the Hull Field of Liberty County maintains the most consistently steady drilling pace.

Pierce Junction

Associated Oil Co.'s No. 1 Boyles is one of the latest good wells added to the Pierce Junction, coming in earlier in the week flowing 1,800 bbls. of 29.6 gravity pipe line oil from a sand at 4,433-47 feet. Gulf Production Co.'s No. 21 Taylor also came in flowing 450 bbls. daily from a total depth of 4,584 feet.

Navarro Oil Co. already has started its fourth test on the Cain lease in the Pierce Junction Field following the completion 10 days ago of its No. 3 Cain as the deepest producer in the pool, flowing 2,500 bbls. from a sand at 5,239-60 feet. No. 3 was an old well deepened, but is thought to have uncovered a new deep producing horizon.

Harrison Oil Co.'s No. 1 Jones, which opened another producing level at 1,609-25 feet in the North Dayton Field of Liberty County by coming in good for a 50-bbl. pumper, began showing a little water the past week, but not in discouraging amount. Bennett Petroleum Co. still has been unable to complete successfully its No. 1 Kirby but is letting the well flow with the possibility that the seal which has been giving trouble might settle in place and shut off the water and sediment. The well Saturday was making around 500 bbls. of fluid, of which approximately 30 per cent was water. The well originally came in making 1,500 bbls. of pipe line oil from a sand at 5,434-68 feet, but after a few hours flow the seal gave way, letting sediment in, killing the well.

Orange County

Considerable activity is under way in Orange County, where between 12 and 15 old wells are being rigged up to work over and deepen. In fact, a large part of the operations in many fields of the coastal territory at present are workovers and old wells being deepened.

Operations in Coastal Louisiana were comparatively inactive. There were no completions there, but two tests were abandoned as dry. One of these abandonments was Gulf Refining Co.'s No. 8 Industrial, on the southwest flank of Starks Dome, Calcasieu Parish. This test was drilled to a total depth of 4,768 feet.

With the abandonment of this test, the entire production of Starks Dome, at present averaging around 375 bbls. daily of net oil, is confined to the northern flank of the dome, where the one remaining test is drilling, the No. 7 Lutcher-Moore. All Starks Dome is operated jointly by the Gulf Refining Co. and the Standard Oil Co. of Louisiana.

Gulf Refining Co. also abandoned a test in the McElroy Field on the Sorrente Dome of Ascension Parish.

Of particular interest in coastal operations was the continued increase in the daily average production at Pierce Junction. The past week the daily average production was 13,409 bbls. due to several good wells which have been completed there in recent weeks. This was a gain of nearly 3,000 bbls. in the daily average over the preceding week.

The increase at Pierce Junction, however, was largely offset by small declines in many other fields, noticeably Spindletop, so daily average production for the district, as a whole continued fairly steady, amounting to 137,356 bbls. as against 137,322 bbls. of the preceding week.

East Central Texas and Southwest Texas fields reflected declines totaling 299 bbls. for the two general districts. Daily average production by fields for the week ending November 26 was:

Daily Average Production

Gulf Coast	
Spindletop	48,388
Saratoga	1,081
Batson	1,256
Goose Creek	7,714
Sour Lake	3,883
Hull	14,069
Big Creek	2,736
Columbia	8,992
Humble	4,547
Pierce Junction	13,409
Blue Ridge	3,334
Markham	255
Orange	4,299
Damon Mound	800
South Dayton	385
South Liberty	1,944
High Island	32
Moores Field	28
Boling	2,193
Nash Dome	1,720
Barbers Hill	800
Vinton	5,019
Starks	326
Edgerly	2,091
Evangeline	1,251
Lockport	5,354
Sulphur	450
Hackberry	1,000
Total this week	137,356
Total last week	137,322
Increase	34
East Central	
Mexia	8,944
Cedar Creek	1,330
Nigger Creek	1,455
Currie	559
Wortham	2,435
Richland	690
Powell	13,578
Total this week	28,991
Total last week	29,076
Decrease	85
Southwest	
Somerset	2,335
Lytton Springs	1,637
Dale	309
Luling	14,967
Miscellaneous	9,095
Total this week	28,343
Total last week	28,557
Decrease	214

Austin County

Humble Oil & Refining Co. has started drilling in No. 1 Wilson, Raccoon Bend district, and at last reports was drilling gumbo at 450 feet. This company's No. 2 Gotosky in the same district is in hard sand at 1,012 feet. These are Humble's only two tests at Raccoon Bend following the abandonment of Nos. 1 Washington and 2 Payne during the previous week. At Brenham, Carlisle and associates have a location for No. 1 Pomacal.

Brazoria County

Roxana Petroleum Corp.'s No. 1 Allen Bernard on Allen Dome is drilling shale and sand at 5,332 feet. No showing has been encountered. This company's No. 4 Allen is in a sandy shale at a total depth of 5,384 feet but is sidetracking the old hole with 4-inch and reaming at 4,510 feet. No. 1 Random is drilling shale, sand and lime at 3,640 feet.

On Clemens Dome, Roxana Petroleum Corp.'s No. 2 Bell is in sand and lime at 4,800 feet.

Chambers County

At Barbers Hill, Mills Bennett Petroleum Co.'s No. 1 Kirby has been completed after considerable difficulty flowing 500 bbls. of fluid, 30 per cent salt water, from sand at 5,434-68 feet. The well originally came in flowing 1,500 bbls. of pipeline oil, but after a few hours' flow the seal gave way letting in enough basic sediment to kill the well. Since then operations have been centered in shutting off the sediment. Humble Oil & Refining Co. has a new test at Barbers Hill, the No. 5 Meyers which is drilling in sand and clay below 62 feet. In the same district Humphreys Corp. has started drilling in No. 6-A Kirby and is down 300 feet.

At High Island, Gulf Production Co. is drilling below 3,340 feet in No. 2 Smith, an old well being deepened. McLean Oil Co.'s No. 10 Cade is drilling deeper at 3,656 feet, and this company's No. 11 Cade around 3,350 feet. McLean's No. 6-C Cade is down 2,427 feet.

DeWitt County

J. T. Roe and associates have a location for No. 1 Leinhart. Other tests in this county are at a standstill.

Fort Bend County

In the Blue Ridge district, J. S. Abercrombie & Co. has a rig up for No. 4 Robinson. These operators' No. 2 West Schenck in the same district is drilling below 3,650 feet. No. 4 West Schenck is drilling below 2,595 feet. Tome Blakely and associates' No. 1 Blakely is drilling below 2,070 feet. H. R. Cullen and associates' No. 1 Blakely is drilling below 2,000 feet. Cunningham Production Co. also has a rig up at Blue Ridge for a test, No. 1 Blakely. This company's No. 3 Blakely is drilling below 2,900 feet. Gordon, Folwell & Dickson's No. 2 Blakely is drilling around 2,500 feet, while their No. 1 Sharp is around 1,600 feet. Gulf Production Co. has started drilling in No. 13 West Schenck and is down below 700 feet. This company's No. 10 Luscher is drilling at 3,980 feet. Navarro Oil Co. set screen at 4,040 feet in No. 1-B Robinson preparatory to a test. Sam Watt is drilling at 2,730 feet in No. 1 Blakely.

At Big Creek, Gulf Production Co. is drilling below 3,400 feet in No. 43 Davis. This company's No. 44 on the same lease is down 3,600 feet.

Rycade Oil Corp.'s No. 18 Wisdom, Nash Dome, is drilling below 1,400 feet, and operations have been started at No. 19 Wisdom. Rycade also has a rig up for No. 20 Wisdom and a location staked for No. 21. This is in the same district where Rycade Oil Corp. completed a well, No. 4 Fritzmier, flowing 168 bbls. daily by heads, two weeks ago.

Hardin County

At Batson, S. R. Buchanan's No. 95 Millhome is drilling below 1,427 feet. Capitol Oil Co.'s No. 9 Hodges, same district, is down 3,937 feet. East Batson Oil Co.'s No. 7 Bates is drilling below 760 feet. The Texas Company's No. 1 Sterling is drilling below 4,205 feet.

Gulf Production Co.'s No. 17 Tabor, Saratoga, is drilling below 1,540 feet. Regna Oil Co.'s No. 2 Teel, this field, is drilling around 845 feet. Weldon Oil Co.'s No. 17 Hooks, which tested dry last week at 525 feet, has been shut down.

Orange Petroleum Co.'s No. 4 Merchant, Sour Lake, tested salt water at 3,775 feet. This is the only drilling well at Sour Lake, it being an old well drilling deeper.

Harris County

Associated Oil Co. has a good well in No. 1 Boyles, Pierce Junction, southwest of Houston. The well on the north side of the dome came in flowing 1,800 bbls. of pipeline oil of 29.6 gravity from a sand at 4,433-47 feet. Gulf Production Co.'s No. 21 E. R. Taylor, this field, came in flowing 450 bbls. daily from a total depth of 4,584 feet. The latter company's No. 22 Taylor is drilling below 3,270 feet, and its No. 1 Perry is below 4,705 feet.

Hute Oil Co. has started drilling in its Pierce Junction test, No. 1 Traper, and is down below 945 feet. Leonard Petroleum Co.'s No. 1 Marland fee is drilling below 3,708 feet. Carl Lipper and associates have a rig up for No. 1 Hamman. Moody Corp. has set strainer at 4,425 feet in No. 2 Hume preparatory for a test. Following the completion of its No. 3 Cain as a good producer the previous week, Navarro Oil Co. has staked location for its fourth test on this lease. No. 3 is the deepest producer in the field and came in flowing 2,500 bbls. daily.

Rio Bravo Oil Co.'s No. 1 P. S. A., Pierce Junction, is down 4,010 feet. Its No. 7 P. S. A. is drilling around 3,408 feet and its No. 1 G. H. & S. A. around 2,850 feet. This company's No. 101 G. H. & S. A. is drilling at 3,247 feet. T. G. Shaw and associates' No. 1 Fitzsimmons is drilling around 2,400 feet. Smith and associates' No. 1 Humble still is standing after encountering salt at 4,320 feet. Sun Oil Co.'s No. 1 Fitzsimmons is drilling around 4,355 feet.

At Goose Creek, Gulf Production Co.'s No. 14 Hoffman Gaillard is to be put on the pump. It has a sand at a total depth of 2,805 feet. This company's No. 21-A Wright is drilling around 2,600 feet. Humble Oil & Refining Co.'s No. 73 Simms-Smith is drilling hard sand and boulders at 1,860 feet. This company is making arrangements to fish out the liner in No. 4 Ashbel Smith. The hole is at a total depth of 2,398 feet. Humble also is making arrangements to work over another of its old wells, the No. 10 Sweet. This well formerly was completed as a producer at a depth of 2,626 feet. Port City Oil Co. is whipstocking at 1,604 feet in No. 1 Grace Addey. Powell Oil Co.'s No. 6 Bryan is drilling around 2,700 feet.

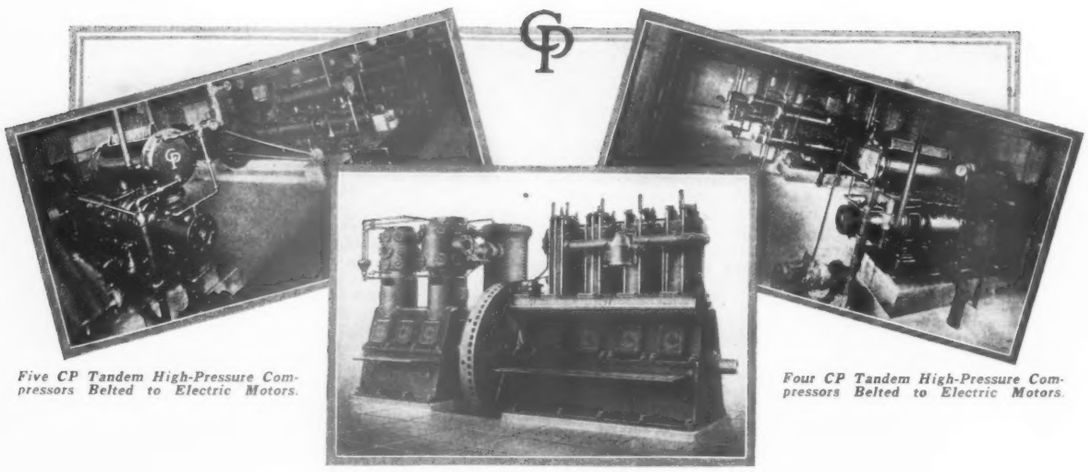
Gulf Production Co. abandoned a test, No. 1 Burt Griffith, in the Humble Field. It was dry at 5,688 feet. Southern Exploration Co. has shut down No. 6 Freeman-State. Strainer was set at 3,410 feet for a test of a sand but the strainer sanded up.

At Hockley, Humble Oil & Refining Co.'s No. 2 Warren is drilling at 2,199 feet. The test encountered a hard sand at 1,926 feet. The 11¾-inch casing was set at 1,640 feet.

Jefferson County

Four wells were completed in the Spindletop Field during the week, three of which were oil producers making a total of 5,458 bbls. of initial production. Yount Lee Oil Co.'s No. 47 McFadden is making 4,000 bbls. of pipe line oil from sand at 2,781 feet, and No. 10 McFadden came in flowing 1,000 bbls. from a total depth of 4,817 feet, deepened from 2,811 feet. Gulf Production Co.'s No. 16 Marrs McLean is flowing 458 bbls. from 4,677 feet. Yount Lee Oil Co.'s No. 37 McFaddin is a gas well at 4,800 feet. Gulf

(Continued on Page 258)



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Eddy Jones Brings in Important Well

Completion in New Champagnolle District, Arkansas, Produces 15,000,000 Feet of Gas and 2,000 Bbls. of Oil

By D. H. Bancroft
Staff Correspondent, North Louisiana-Arkansas

SHREVEPORT, La., Nov. 28.—Coming in with an estimated 15,000,000 feet of gas and 2,000 bbls. of oil, Eddy Jones' No. 1 Crain in the SE cor. NE NE, Section 2-17-14, in the new Champagnolle district of Union County, Arkansas, gave the fraternity in these parts the biggest kick it has had since Arkansas Fuel Oil Co. completed the discovery well in the Pleasant Hill district of Sabine Parish, Louisiana, last February. The well came in about noon last Wednesday flowing 100 bbls. per hour through a 1-inch choke in a 4-inch flow line.

With 15,000,000 feet of gas it was produced through separator for about six hours until the separator blew up. It flowed wide open for two or three hours during which it was estimated to be making at the rate of 2,000 bbls. per day with the same amount of gas. It then was closed in, awaiting pipe line connections furnished by the Magnolia Pipe Line Co., which has a 4-inch from Lege tank farm 6 miles north of El Dorado to Ohio Oil Co.'s production in Section 1-17-14. Producing from 4 feet of sand at 3,058-62 feet the well made oil testing 26.5 gravity at 73 degrees.

Three-eighths of a mile northwest of the Ohio's production, the new producer is in the same sand whence the Ohio's wells are producing and is the third good producer in the Champagnolle area where, in all, a half-dozen wells have been drilled with as many more under way.

Rovenger Oil Corp.'s No. 1 McCain, in Section 4-17-14, the first producer, did not hold up as a commercial well in a different sand at 2,834 feet and is being deepened in search of the Ohio's sand. It tested salt water at 3,062 feet. About 2 miles southwest of Jones' well, Garrett-Modisette Drilling Co. is ready to bail No. 1 Gregory, SE cor. NE SE, Section 10-17-14, having 4 feet of sand at 2,761-65 feet with 6⅝-inch casing set at 2,755 feet. This sand is believed to be the same as that found by the Rovenger Oil Corp.'s discovery well and while it developed a show sufficient to fill four fourbles of 3½-inch drill stem on Johnson test, there appears to be some doubt that it will turn out commercially. In that event it will be deepened to the 3,000-foot stuff.

Important as the Jones well is, it is doubtful that there will be any immediate drilling beyond that required to preserve leases or determine the extent of the new pool, as practically all the acreage save a few scattered "40's" or other such small parcels are in the hands of Ohio, Pure and Magnolia Petroleum companies and with the crude situation in its present state there is no incentive for developing prospective new pools. Prices at which landowners value their leases are also more or less a deterrent.

While Jones was testing his well the Ohio Oil Co. was also testing No. 1 W. Pumphrey in the SW cor. NE, Section 1-17-14, getting salt water in 4 feet of sand 2,944-48 feet, corresponding to the pay in the Rovenger discovery well, and is coring and drilling down to the pay in its Crain wells.

Other completions in proven areas during the week were mostly gassers, eight such having a total initial open flow of 81,986,000 feet per day. The new 3,900-foot stuff in Pine Island yielded its best producer and one of the best in that field since the Haynes discovery well started things all over again last June when Dixie Oil Co. completed No. 89 Dillon in Section 14-21-15, at 3,997 feet with an initial 960 bbls. on November 22. Since then the producer, unlike those in the 3,600-foot pay, which invariably decline a few hours after completion, has increased its flow to 1,180 bbls. On completion it was flowing pipe line oil but during the last few days a small amount of water, less than 100 bbls. has appeared. The seven producers in the 3,900-foot stuff, of which the Dixie well is the latest, are running 2,350 bbls. daily of 38 gravity crude.

Superior Oil Co.'s No. 6 Youree in Section 26-20-15, was completed November 17 pumping 10 bbls. from total depth of 2,301 feet. T. D. Gray and others put No. 1 J. J. Hart, Section 29-21-16, Vivian district, on the beam for 15 bbls. from 2,393 feet. In the Greenwood gas district Belchic & Laskey completed No. 3 R. T. Sharp, Section 10-18-16, making 1,500,000 feet of gas from the shallow sand at 910 feet and W. H. Cross' No. 1 State Line Hunting and Fishing Club, Section 17-17-16, was completed in the same sand making 3,400,000 feet initial from 942 feet.

Three wells were completed in the Ouachita Parish section of the Monroe gas district. Imperial Oil & Gas Products Co.'s No. 2 Stubbs in Section 13-19-3e, gauged 4,000,000 feet total depth 2,155 feet; Industrial Gas Co.'s No. 1 McGee, Section 3-18-4e, made only 500,000 feet from 2,189 feet and may be deepened slightly. Ladel Properties' No. 45 fee, Section 20-20-5e, gauged 12,643,000 feet, total depth 2,223 feet.

Magnolia Petroleum Co.'s deep test in Cotton Valley, No. 3 Cox, Section 23-21-10, gauged 3,175,000 feet from the Glen Rose horizon of the Trinity at 4,518 feet, pressure gauge showing 1,735 pounds. In the Sarepta gas district, north of Cotton Valley, Magnolia also completed No. 1 Wise in Section 30-23-9, gauging 34,794,000 feet at a total depth of 2,718 feet with the bottom only a foot in the sand.

Aside from the Jones well in Champagnolle territory, Arkansas fields had only two completions, both failures. The Texas Company abandoned No. 1 Davidson in Section 26-15-16, Ouachita County, as a junked hole at 2,775 feet when it gave up trying to get a grip on several joints of 4-inch drill stem. The well, on the north fringe of the Louann district of Smackover, tested salt water at 2,587 feet and again at 2,717 feet. Magna Petroleum Co.'s No. 6 Tatum, in Section 7-16-15, Union County, in the Norphlet district shot 6-inch casing and tested salt water at 2,450 feet after setting a short string of 4½-inch at 2,698 feet, testing salt water at 2,704 feet and plugging back to 2,400 feet.

In the Pleasant Hill Field of Sabine Parish, Moffat and others are arranging to pump No. 3 Moore in Section 5-9-12. The well tested dry at 3,268 feet after cementing 6⅝-inch casing at 3,207 feet, was deepened 64 feet to 3,332 feet with 15 feet of sand and filled up 1,000 feet with oil.

The Texas Pipe Line Co., the last to do so, posted new prices on Smackover light and heavy oil to meet Standard Oil Co.'s posting as of November 21, making the new schedule unanimous among the 14 pipe lines serving Smackover. Some of these buyers have been paying a 10-cent premium on the heavy oil, but as fast as contracts are filled the premiums are abolished.

Sale of the Houston Oil Co.'s 6-inch gas line from Smackover gathering system to refinery at White City, 3 miles south of Camden, Ark., was announced during the week. The buyer, Ouachita Natural Gas Co., is building a gas line from the Monroe fields to Camden by way El Dorado and Smackover and will use the 16 miles of line built by the Houston company several years ago as a fuel line for the refinery, as a part of its system. The line will be 16-inch from Monroe to El Dorado and the builders are negotiating for an 8-inch line from El Dorado to Smackover to be incorporated as a part of the system. This will be the third line into Camden from the Monroe and Richland gas fields of northeastern Louisiana. Natural Gas & Fuel Corp. supply fuel from Richland and Monroe through the old Crusader 10-inch line which it leased from the Continental Supply Co., and Electric Bond & Share Co. building another.

Another suit in the long-drawn-out litigation concerning lease titles and royalties between operators on Caddo Lake lands and the State of Louisiana and the Caddo Levee Board was filed last week by the latter agency against the Standard Oil Co. and the Pure Oil Co. The board claims $13,663 in royalties from the Standard Oil Co. and $18,625 from the Pure Oil Co., setting forth that it is the owner of approximately 30 acres in Section 3-20-16, Caddo Parish, which was erroneously excluded from a survey of lake lands which became state property on Louisiana's admission to the Union and were subsequently deeded to the board by the state. Three wells were drilled on this tract, the oil being taken by the two defendants who have not paid the royalties because of claims to title to the land being filed by various parties, which litigation has only recently been settled.

Production Off 1,000 Bbls.

Production from the North Louisiana and Arkansas fields continued its slow decline, though the difference between this week and last was only about half as great as between the daily average runs for last week and the week before. Daily average runs for the week ending November 26 were 145,950 bbls., 1,063 under those for the week ending November 19 whereas that week's average of 147,013 bbls. was a decline of 2,172 bbls. from that of the preceding period.

Louisiana pools shipped an average of 49,140 bbls. this week, a decline of 430 bbls., and Arkansas' average of 96,810 bbls. was 633 less than that of the week before. Only three pools, DeSoto, Red River, El Dorado, and Pleasant Hill, showed any increase, the former gaining 230 bbls. and the latter 15 bbls. El Dorado runs increased 102 bbls. Smackover heavy oil runs fell off 415 bbls. to 73,570 per day and the light oil runs of 9,485 bbls. were 225 under last week's average. Movement of Caddo light oil, 12,410 bbls. per day, was 90 bbls. less than last week and the heavy oil from this district was 315 bbls. per day less. Daily average runs from the several pools this week and the week before were the following:

	Nov. 26	Nov. 19
Caddo light	12,410	12,600
Caddo heavy	4,076	4,385
Homer	4,660	4,700
Haynesville	6,935	6,945
DeSoto-Red River	4,330	4,100
Elm Grove	675	680
Bellevue	1,040	1,050
Cotton Valley	5,100	5,100
Urania	9,050	9,155
Pleasant Hill	870	855
Total Louisiana	49,140	49,570
El Dorado	6,050	5,948
Smackover light	9,485	9,710
Smackover heavy	73,570	73,985
Stephens	1,200	1,200
Nevada County	3,680	3,750
Lisbon	2,725	2,750
Bradley	100	100
Total Arkansas	96,810	97,443
Both states	145,950	147,013

NORTH LOUISIANA
Bossier Parish

Carterville—Arkansas Natural Gas Co. is rigging up to drill No. 1 Barnett, Section 17-23-12, their first well in this field. Bahan & Davis' No. 1 Dodson, Section 15-23-12, bailed dry at 3,087 feet. Six-inch casing was cemented at 3,083 feet and there is a possibility that this was too low and they will perforate casing

(Continued on Page 233)

NORTHEAST LOUISIANA EXTENSION HOLDS WILDCATTERS' ATTENTION

By D. H. Bancroft

SHREVEPORT, La., Nov. 28.—Coming on the heels of announcement of a $20,000,000 pipe line project with Richland Parish gas as the source of supply, extension of proven area of the new northeast Louisiana field 6 miles northeast concentrated attention of wildcatters on that part of the country in the face of a completion of major proportions in the new Champagnolle oil field in Union County, Arkansas, and a wildcat test in Sabine Parish. Woodley & Collins and the Triangle Drilling Co. brought in the extension, No. 1 Hemler, in the SW cor. SW SE Section 31-18-7e, which, while small—2,974,000 feet— is nevertheless a commercial well and, it appears, is on a different structure from previous completions in the older part of the field. It is producing from 5 feet of sand, 2,473-78 feet, and initial rock pressure was 1,115 pounds.

In connection with this Richland development, activities of the Moody-Seagraves interests who are reported planning the gas line to St. Louis, are of interest. With several thousand acres already blocked they are adding to their holdings whenever a satisfactory proposition is offered. They last week took over the W. C. Feazel holdings of a few thousand acres and two drilling wells and immediately made location for a third, giving them a total of nine operations under way, all but one in proven territory. One of the two wells taken over in the deal, details of which have not been given out, is nearing testing depth and the other has set second string.

Also in connection with Richland developments are persistent rumors of a second pipe line project of major proportions to serve the same ends as the Moody-Seagraves undertaking. Local headquarters of one of the companies said to be involved, however, denied that they were even interested but it is noted that they are wildcatting in that part of the country and have been in the gas, gasoline and carbon business in the Monroe Field for years.

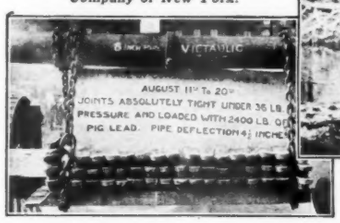
All this news breaking from Richland rather shadowed the completion of Mississippi's second commercial gas well, Natural Gas & Fuel Corp.'s No. 1 Rye, Section 22-15-17, Monroe County, last week. Soon after being brought under control the well was shut in and it will remain so while a lot of title curing work is under way, after which it is proposed to shoot the formation from which it is producing its 3,000,000 feet of gas.

There was much of interest in wildcat activities during the week, chief of which aside from the Champagnolle and Richland developments referred to, were L. M. Emlet's test in Sabine Parish and L. L. McDonald's in Nevada County, Arkansas. Emlet has been working with

(Continued on Page 263)

Some Companies That Use VICTAULIC Couplings

Standard Oil Co. (N. J.)
Anaconda Copper Mining Co.
Skelly Oil Co.
Consolidated Gas Co. of New York
Metropolitan Water Board
International Petroleum Co., Ltd.
Hope Natural Gas Co.
Standard Oil Co. of La.
Springfield Gas Light Co.
Tennessee Copper Co.
Chestnut & Smith Corp.
Globe Gasoline Co.
Tri State Zinc Co.
Lago Petroleum Corp.
North American Trading & Import Co., Inc.
Hartford City Gas Light Co.
British Oil Refineries, Ltd.
Sir W. G. Armstrong-Whitworth & Co., Ltd.
Humble Oil & Refining Co.
Venezuela Gulf Oil Co.
Anglo-Chilean Consolidated Nitrate Corp.
Texas Pipe Line Co.
E. I. DuPont De Nemours & Co.
Roxana Petroleum Corp.
Houston Gas & Fuel Co.
Westchester Lighting Co.
Sinclair Oil & Gas Co.
Granby Consolidated Mining, Smelting & Power Co., Ltd.
Caribbean Petroleum Co.
St. Joseph Lead Co.
Midwest Refining Co.
Ely Calumet Mining Co.
Marland Refining Co.
Ranney Oil Mining Co.
Andes Copper Co.
Pan American Petroleum & Transport Co.
Golden Rod Mining & Smelting Co.
Andian National Corp., Ltd.
Oklahoma Northern Utilities Co.
Miami Copper Co.
Asiatic Petroleum Co., Ltd.
American Trona Corp.
Vacuum Oil Co.
Bucyrus Co.
Gulf Production Co.
Chile Exploration Co.
Standard Oil Co. of New York


VICTAULIC
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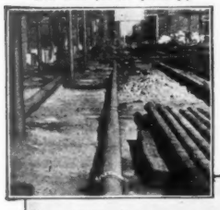
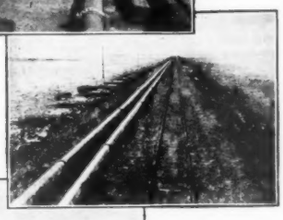
8" pipe test, Consolidated Gas Company of New York.

8" oil line, Roxana Petroleum Corporation.

12" oil line, Gulf Pipe Line Company.

8" kerosene line, Standard Oil Co. (New Jersey)





12" oil line, Standard Oil Co. of New York.

6" gas line, Standard Oil Co. of Louisiana.

Oil Gathering Lines.

10" and 12" oil lines, International Petroleum Co., Ltd.

2" gas line, Chestnut & Smith Corporation.

10" Gas Line Westchester Lighting Company.

12" molasses line The North American Trading and Import Co., Inc.

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California Output to Continue High

Long Beach May Reach Peak Next June or July With Production of State Averaging Above 600,000 Bbls. Daily

By L. P. Stockman
Staff Correspondent, California Fields

LOS ANGELES, Calif., Nov. 26.—The production situation in California presents a rather interesting picture at the present time, although it is the same old story of starting off a new year with a lot of production in sight. When final figures are compiled it will probably be found that California's crude oil production during 1927 will exceed the output during 1925 and 1926. During the first 10 months of this year the state has yielded 193,296,173 bbls., as compared with a total yearly production of 230,147,342 bbls. in 1925, and 224,117,013 bbls. in 1926. In addition to this actual crude oil production there has been an average of about 75,000 bbls. per day shut in during the entire period.

California's daily crude oil production has not dropped below the 600,000-bbl. mark in over a year and from present indications it cannot be expected to do so in the near future. It is a little too early to say just how high production will go in 1928, but with Long Beach and Seacliff expected to register appreciable increases it is needless to say that state production will still be above the 600,000-bbl. mark next summer. A careful check indicates that Long Beach will probably reach its 1928 peak along about June or July. The field should reach about 150,000 bbls. per day, due to exploitation of the deep sand, and may exceed that figure if future completions hold up to anything like their initial.

New Production

The maximum potentiality of the newly discovered field at Seacliff in Ventura County is still undetermined, but something definite should be ascertained in the very near future. The Pan American's discovery, No. 1 State, has been bothered with a troublesome water condition since the original completion and hence no concrete basis is available upon which to predicate a possible peak. Practically everyone admits that this new field will show a rather favorable production, but it is in no way comparable to the prolific Ventura Avenue Field, some 6 or 7 miles to the east. Production in the latter district incidentally could be stepped well above 100,000 bbls. per day if desired. As soon as another well or two is completed at Seacliff operators will be able to make a fairly good guess as to its possible production in 1928, but right now all estimates are made in the dark and therefore subject to correction. Potrero will probably have a finger in California's 1928 production, but this field is not expected to exert any very substantial affect as recent developments indicate that the field will be rather limited in area with the total probable productive acreage closely held.

The most serious threat to California's production equilibrium in 1928 comes from the San Joaquin Valley Basin, where a number of promising wildcat areas are at present being tested out. If recent developments are any criterion this section of the state will come in for considerable play during the next year and it is quite possible that one or more new fields may be finished in that vast area within the next six months. The latest wildcat in the San Joaquin Basin to show production tendencies is the General Petroleum's No. 1 Edison, southeast of Bakersfield, in Kern County, and core samples indicate that the company has an excellent chance of getting commercial production, although some additional hole may be added before a definite bid is made for production. The outlook is exceptionally promising at 4,009 feet and if a production test is made within the next few days, instead of drilling ahead, as now contemplated, this wildcat may have opened up a new oil field before this gets into print. The showings picked up consist of a number of oil sand streaks of varying thickness and, while no definite well defined horizon has been found, the large number of streaks logged may prove productive. The most important factor in connection with the find of the General Petroleum is the fact that the Edison district is a theoretical interval based on the showings of the Pacific Eastern's Union Avenue test at Bakersfield. Another theoretical interval at Fruitvale is being tested out by the Pacific Eastern and this trio of highs should be watched very closely during the next several months for if a commercial producer is finished in any one area the others look like almost sure shots. These three districts, which are about 5 miles apart, are all located on the Bear Mountain Sheer Zone which runs in a northwest-southeast direction.

Daily production of crude oil in California during October fell off 8,099 bbls. from September but this is only a temporary condition as all indications point to a very appreciable increase early next year due to deep drilling at Long Beach and an appreciable amount of development work in the new Seacliff Field in Ventura County. The drop in production during October was more or less general, that is, no single field showed a loss in excess of a few thousand barrels. Midway-Sunset, Ventura Avenue, Huntington Beach and Seal Beach were all down but the increase shown by Kern River and Long Beach offset their combined drop to some extent. The total fluid stocks held on the Pacific Coast continued to decline but this is an artificial condition due to curtailment in production and heavy shipments to Atlantic and foreign ports. Light refinable crude and naphtha tops were off 1,183,377 bbls. and 321,145 bbls., respectively. Gasoline stocks on the other hand increased 355,467 bbls. during the month and this commodity, which has shown several substantial accumulations during the year, is well above the amount on hand at the beginning of 1927.

Long Beach

Drilling operations in the Long Beach Field resulting from the exploitation of the deep zone showed a rather appreciable increase during the current week and, judging by the number of new locations already staked, a further substantial gain can be anticipated in the near future. The latest concern to come out with a definite exploitation program is the A. T. Jergins Syndicate and, although this action was a foregone conclusion, it did not become a reality until a few days ago. Three new wells, Nos. 15, 22 and 23, will be drilled on the Municipal lease at once and several more will undoubtedly get under way in the near future. The city of Long Beach, incidentally, will benefit to a very appreciable extent due to this new work as the municipality's lease with Jergins calls for a 40 per cent royalty on all oil and gas produced. The city's crude oil royalty at the present time is approximately 2,500 bbls. per day but this may possibly be doubled within the next six or eight months if drilling operations are carried to a successful conclusion. The posted price for this grade of crude is 89 cents per barrel, but the city by using its prerogative of accepting the royalty in kind has been able to dispose of its portion at a bonus of 15 cents per barrel.

The California Petroleum Corp., the second largest lease holder in the Long Beach Field, has started a rather ambitious drilling program and it is needless to say that a very favorable increase in production can be expected as a result of this work. The company should have 12 strings of tools in actual operation on the Brown, Ellis, Lewis, McDavid, Perrin, Robinson, Davidson, Flowerstate, Harlow Kent, Reedy Dubois and Griswold leases within the next 21 days. Three of these holes have already been spudded in and, with rigs going up for the remainder, the company's field department will experience a very busy period during the next six months. The

(Continued on Page 234)

TANKER SHIPMENTS FROM LOS ANGELES TO ATLANTIC AND GULF COAST PORTS

Commodity—	This Week Total	Average Daily	Last Week Total	Average Daily	to Date This Year	Last Year Same Time
Crude oil	158,430	22,633	215,429	30,776	8,935,594	10,302,671
Fuel oil	.....	.....	.....	.....	6,716,619	6,292,335
Diesel and gas oil	71,362	10,195	.....	.....	2,375,151	2,866,579
Gasoline	189,425	27,061	144,199	20,600	7,964,273	6,232,106
Tops	.....	.....	.....	.....	.....	374,504
Coastwise—						
Crude oil	383,998	54,857	341,425	48,775	21,380,305	20,703,354
Fuel oil	248,420	35,489	349,490	49,927	11,342,757	10,154,814
Diesel and gas oil	15,653	2,236	159	23	356,860	165,935
Gasoline	300,941	42,992	272,908	38,987	8,753,341	6,769,073
Kerosene	9,117	1,158	17,374	2,482	230,801	183,239
Tops	.....	.....	66,980	9,594	219,255	501,520
Exports—						
Crude oil	63,350	9,050	12,013	1,716	2,138,240	3,597,698
Fuel oil	374,263	53,466	576,338	82,334	24,800,827	16,150,881
Diesel and gas oil	9,575	1,368	9,110	1,301	1,256,724	532,630
Gasoline	152,841	21,834	84,994	12,142	4,585,878	4,251,767
Tops	.....	.....	.....	.....	227,204	141,467
Kerosene	58,596	8,371	69,078	9,868	1,953,467	2,646,482

TANKER SHIPMENTS FROM SAN FRANCISCO TO ATLANTIC, GULF COAST PORTS

Fuel oil	.....	.....	.....	.....	.....	78,653
Diesel and gas oil	.....	.....	91,422	13,060	762,762	1,613,145
Gasoline	78,033	11,148	90,473	12,925	1,928,520	853,312
Tops	.....	.....	.....	.....	.....	73,698
Lubricants	.....	.....	.....	.....	370,180	407,860
Coastwise—						
Fuel oil	83,882	11,983	.....	.....	4,464,101	4,986,999
Diesel and gas oil	6,993	999	8,101	1,157	223,583	.....
Gasoline	80,479	11,497	62,357	8,908	4,564,294	4,110,715
Kerosene	4,618	660	10,248	1,464	213,109	301,764
Exports—						
Fuel oil	55,488	7,927	75,118	10,017	2,381,308	2,863,280
Gasoline	65,411	9,344	228,825	32,689	2,678,443	1,870,784
Kerosene	.....	.....	77,381	11,054	897,155	1,879,829
Lubricants	.....	.....	.....	.....	26,695	66,706

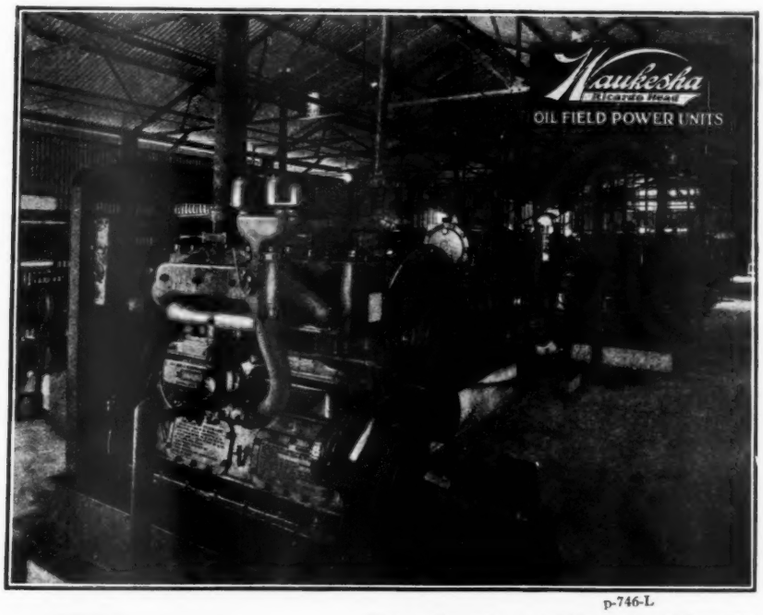
IMPORTANT SOUTHERN CALIFORNIA WILDCATS

Company, Well and Location—	S-T-R	Depth	Status
Associated, No. 1 Cypress, Potrero	24- 2-14	5,210	deepening
Smith & Carpenter, No. 1 Smith	35- 2-14	5,282	rebuild rig
Hurst Oil Corp., No. 1 Inglewood, Los Angeles, Co.	28- 2-14	3,772	suspended
Mont. Park. Oil Co., No. 1 Browning, Mont. Park.	26- 1-12	3,020	little showing
Associated, No. 1 Patterson, Pico	13- 2-12	2,702	sd. sh. drilling
Circle Oil Co., No. 1 Pomeroy, Manchester	23- 3-14	4,280	suspended
Shell, No. 1 Mission, San Fernando	4- 2-15	4,583	coring
Sou. Calif. Drlg. Co., No. 1 Matteson, El Segundo	1- 3-15	4,370	suspended
Carr, O. K., No. 2 Foster, San Juan Capistrano	13- 8- 8	4,230	hd. sd. drilling
Thomason & McCoy, No. 1 Rinz, Saugus	27- 5-16	1,610	suspended
Southwest Pet. No. 1 Ramsauer, Watts	4- 3-13	4,267	sd. sh. drilling
San Clemente Oil Co., No. 1 Peck, Hawthorne	20- 3-14	5,536	to test
O'Donnell, J. E., No. 1 Dupree, Hawthorne	29- 3-14	5,304	suspended
White Behr, No. 1 Watson, L. A. County	21- 4-14	2,411	hd. sd. drilling
Shell, No. 1 Alice, Placentia	31- 3- 9	4,971	hd. hd. drilling
Standard, No. 1 Olive, Orange Co.	17- 4- 9	4,865	hd. sd. drilling
Son. C. A., No. 1 Pinkerton, Orange Co.	5- 5-11	3,591	sd. sh. drilling
Ohio Oil Co., No. 1 Bolsa Dome, Orange Co.	35- 5-11	4,230	hd. sd. drilling
Stein, Leo, No. 1 Long, Orange Co.	21- 5-11	4,720	hd. sd. drilling
Shell, No. 1 Stern, Orange Co.	22- 3-10	1,493	hd. sd. drilling
Standard, No. 1 Rindge, Palms	36- 1-15	Rig	in litigation
Hemet Pet. Co., No. 1 Ward, Riverside Co.	9- 3- 1	1,650	hd. sd. drilling
Fuller & Gray, No. 1 Puente, L. A. County	14- 2-10	Rig	rigging up
Anchor Oil Co., No. 1 Hudson, Los Angeles Co.	19- 2-10	2,395	suspended
Pet. Securities, No. 1 Newport, Orange	3- 6-10	3,910	hd. sd. drilling
Olympic Refg. Co., No. 1 Sunset Beach, Orange Co.	.....	.....	location
Turner, S. S., No. 1 Escondido, San Diego Co.	.....	Rig	rigging up

IMPORTANT NORTHERN CALIFORNIA WILDCATS

Associated, No. 1 Smith, Kettleman Hills	12-23-18	2,043	suspended
Bolsa Chica, Well No. 1 Kettleman Hills	30-23-19	3,502	suspended
General Pet., No. 1 Burbank, Kettleman Hills	30-23-19	3,105	pipe bad
General Pet., No. 2 Oschener, Kettleman Hills	26-22-18	5,299	set casing
General Pet., No. 1 Dome, Kettleman Hills	4-24-19	3,800	suspended
South Coalinga, Well No. 1, Kettleman Hills	35-24-19	2,930	pipe trouble
Monocline Dev. Co., Well No. 1, Kettleman Hills	7-21-21	3,790	sd. sh. drilling
McPhail, Hugh, Well No. 1, Kettleman Hills	13-24-18	2,160	hd. sd. drilling
Milham Explth., No. 1 Kettleman, Kings Co.	2-22-17	5,570	br. sh. drilling
Shell, No. 2 Berlywood, Moorpark	32- 3-20	6,084	hd. sd. drilling
Star Petroleum, No. 2 Canet, Ventura Co.	13- 3-23	3,021	hd. sd. drilling
Continental Oil Co., No. 1 Burnham, Ventura Co.	22- 5-18	3,372	hd. sd. drilling
Standard, No. 1 Camarillo, Ventura Co.	29- 2-20	5,692	hd. sd. drilling
Petroleum Sec., No. 1 Diablo, Ventura Co.	26- 5-18	3,397	gr. sd. drilling
Parkford, E. A., No. 1 Strathern, Ventura Co.	5- 2-18	4,002	to test
Shell, No. 1 Strathern, Ventura Co.	6- 2-18	919	sd. drilling
Miley Oil Co., No. 1 Red Mountain, Ventura Co.	7- 3-25	980	suspended
Richfield, No. 27 Piru, Ventura Co.	35- 5-18	1,902	suspended
Superior Oil Co., No. 1 Fillmore, Ventura Co.	33- 4-20	.....	location
Milham Explth., No. 2 Buttonwillow, Kern Co.	8-28-23	4,662	gas well
Milham Explth., No. 3 Buttonwillow, Kern Co.	7-29-24	4,150	suspended
Morris, F. L., No. 1 Semitropic, Kern Co.	16-27-23	.....	location
Pacific Eastern, No. 1 Fruitvale, Kern Co.	21-29-27	2,991	gr. sd. drilling
Pacific Eastern, No. 1 Bakersfield, Kern Co.	6-30-28	4,535	deepening
Barnes, L. S., No. 1 Stine, Kern Co.	11-30-27	.....	location
General Pet., No. 1 Edison, Kern Co.	5-30-29	4,009	looks good
Getty, George F., No. 1 Edison, Kern Co.	22-29-29	3,681	gr. sd. drilling
Midway Northern, No. 1 Edison, Kern Co.	29-29-30	Mtl.	building rig
Union, No. 1 Mon Bluff, Kern Co.	28-27-28	193	sd. drilling
California Pet., No. 1 Adobe, Kern Co.	25-27-28	1,219	to abandon
Shell, No. 1 Mon Bluff, Kern Co.	3-28-28	3,173	hd. sd. drilling
Superior, No. 1 McFarland, Kern Co.	11-26-27	2,175	bl. sh. drilling
North American, No. 1 Wallace, Delano	5-25-26	3,703	fishing
Fresno Madera Oil Co., No. 1 Clovis, Fresno	18-12-21	3,830	hd. sd. drilling
Barneyberg Oil Co., No. 1 Brown, San Luis Obispo	25-32-14	2,205	to test
Richfield, No. 1 Wreden, San Luis Obispo Co.	10-29-17	2,017	hd. sd. drilling
Miley Ex. Co., No. 1 Carissa, San Luis Obispo Co.	15-29-17	Rig	rigging up
Union Oil Co., No. 1 Huasna, San Luis Obispo	34-32-15	Rig	rigging up
Shell, No. 1 Cowell, San Mateo Co.	8- 6- 5	5,021	hd. sd. drilling
Shell, No. 1 Murphy, Petaluma	29- 5- 6	6,382	to abandon
Shell, No. 2 Murphy, Petaluma	8- 5- 6	1,960	hd. sd. drilling
Thomas & Hammill, Well No. 1 Alemeda Co.	16- 3- 3	1,470	suspended
Buttram, F. W., No. 1 Odin, Santa Barbara Co.	20-25-27	943	sd. drilling
Elliott & Clarke, No. 1 Marcos, Santa Barbara Co.	3- 6-29	3,020	br. sh. drilling
Gorham, G. O., No. 1 Orcutt, Santa Barbara Co.	33-10-34	Mtl.	building rig
Becker, G. F., No. 1 Summerland, Santa Barbara	33- 4-25	3,060	shut off N. G.
Twin State, No. 1 Modoc, Santa Barbara Co.	20- 4-27	Rig	rigging up
Birch Oil Co., No. 1 Porterville, Tulare Co.	13-20-26	2,470	hd. sd. [illegible]

Typical Waukesha Powered Air Lift Plant at Bowlegs, Okla.



p-746-L

Where Waste Gas Is Available

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P-787-L

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Eastern Fields Get Large Producer

Perry County's 339-Bbl. Completion Biggest in Months
Noble County Has 150-Bbl. Well. W. Virginia Big Gasser

By D. S. Wakenight
Staff Correspondent, Eastern Fields

PITTSBURGH, Pa., Nov. 28.—What promised to be a very dull week in the Eastern Fields was averted just at the close by drilling several good producers in the deep-sand territory in southeast Ohio. One of the two good wells drilled in is the largest completed in the Eastern Fields in many months. It is very gratifying to get a large producer when nearly all completions are no better than light pumpers. All wells completed during the early part of the week came in light, not better than a 60-bbl. producer. Both West Virginia and southwest Pennsylvania had several better than the average for these fields.

Best Wells for the Week

In the NW of Section 21, Harrison Township, Perry County, William Cline and others have completed a test on the J. C. Sowers farm. It produced 339 bbls. the first 24 hours after it was drilled through and shot in the Clinton sand.

In the NE of Section 24, Jefferson Township, Noble County, Joseph Sailing & Co. has completed a test on the Alice Feldner farm. It produced 150 bbls. the first 24 hours after drilled into the Germantown sand.

Near Mt. Morris, Perry Township, Greene County, the Moore-Rax Oil Co. (J. H. McDermott and others) drilled down to the Big Injun sand an old gasser on the John Lemley farm. It is estimated this well is good for 50 bbls. a day. The owners swabbed 85 bbls. the first 24 hours. It is in defined territory.

On Georges Run of McElroy Creek, McElroy district, Tyler County, West Virginia, Sutton Brothers completed in the Maxon sand a test on the David Shuman farm. It is good for 50 to 60 bbls. a day. On Lamb's Run, Murphy district, Ritchie County, the West Fork Oil & Gas Co. completed in the same formation a second test on the Lena Sanderson farm and it is good for 50 bbls. a day.

Gassers were very much in evidence in the list of late completions in the West Virginia fields. In Carroll district, Lincoln County, L. R. Sweetland completed No. 25 on his own farm and it is a gasser in the Berea grit. In Jefferson district, G. T. Ray & Son have a gasser in the same formation at a second test on the James Cooper farm.

In Grant district, Cabell County, the United Fuel Gas Co.'s test on the O. W. and S. J. Miller farm is a gasser in the Big Injun sand. In Curry district, Putnam County, Wysong & Jaynes have a gasser in the Berea grit at a second test on the Roberts-Vanderlinde farm.

Fair Producer in Marion County

In Mannington district, Marion County, the Buffalo Oil Co. has completed in the fourth sand its test on the N. C. Grim farm. It is producing 40 bbls. a day. In the same district, the South Penn Oil Co. drilled down from the Big Injun sand No. 8 on the Joseph Campbell farm. It is a gasser in the lower formation. It was formerly a light oil well in the Big Injun sand.

On Rush Run, Smithfield district, Roane County, Godfrey L. Cabot has completed in the Big Injun sand a test on the E. B. Harless farm. It is a gasser. On Little Sandy Creek, Big Sandy district, Kanawha County, the United Fuel Gas Co. has a gasser in the Big Injun sand good for 260,000 feet on the James T. Snyder farm.

On Barnes Run, Lee district, Calhoun County, Smith & Starcher have completed in the Big Injun sand a test on the C. W. Starcher farm. It is a gasser good for 250,000 feet. On Steer Creek, Center district, Gilmer County, the Carnegie Natural Gas Co. has completed in the same formation a second test on the T. N. Marshall farm. It is a duster.

On Indian Creek, Murphy district, Ritchie County, J. T. Deem and others have a rig up for a test on the W. Baker farm. On the same stream, Frank Bowser is drilling a second test on the J. Grimm farm. The Hope Natural Gas Co. is drilling a test on the T. N. Johnson farm.

Gilmer County

Creed Barker and others have completed in the Big Injun sand a test on the E. Davis farm. It is a light gasser in DeKalb district. In the same district S. G. Roberts & Co. had the same luck at No. 3 on the Albert Bell farm.

In Freeman Creek district, Lewis County, Moran Brothers & Co. completed in the Big Injun sand a test on the M. E. Parsonage lot. It is a light gasser. On Straight Creek, Burning Springs district, Wirt County, the South Penn Oil Co. is drilling down from the salt sand to the Big Injun its old No. 1 on the Pepper heirs' farm.

On Pawpaw Creek, Pawpaw district, Marion County, the Carnegie Natural Gas Co.'s test on the Rebecca Tennant farm is a gasser in the fifth sand. In Cass district, the same company's test on the Elmer Brand farm is a gasser in the salt sand.

On Poca River, Poca district, Kanawha County, the Charter Oil & Gas Co. has the rig completed for a test on the Mary Paully farm. On Pawpaw Creek, Pawpaw district, Marion County, the Owens Bottle & Machine Co. has started to drill a test on the William Valentine farm.

In Geary district, Roane County, the South Penn Oil Co. has completed in the Big Injun sand No. 62 on the O. D. Stockly farm, good for 25 bbls. a day. In the same district and county, the Ogden & Geary Oil Co. completed in the same formation and has a gasser good for 18,000,000 feet. It is the best gasser ever completed in Roane County.

On Twelve Pole Creek, Harvey district, Mingo County, the Public Gas Corporation has drilled deeper No. 18 on the Logan Cannel Coal Co.'s property and it is good for 900,000 feet.

In Reedy district, Roane County, the Heck Oil Co. gave its No. 10 on the J. W. Conley farm a 70-quart shot and increased its production to 75 bbls. a day. On Big Pawpaw Creek, Pawpaw district, Marion County, the Hope Natural Gas Co. has completed in the fifth sand its test on the Rebecca Tennant farm. It is a fair gasser.

On Reigens Run of McElroy Creek, McClellan district, Doddridge County, the Keystone Oil Co. of New York has completed a second test on the J. R. Roberts farm. It is good for 5 bbls. a day in the Maxon sand.

One-half mile above the mouth of Road Run, Lee district, Calhoun County, the McCall Drilling Co. has drilled a test on the Alva Laughlin farm through the Berea grit and dry. A fair gas pressure was developed in the Big Injun sand, but they will drill through the Gordon sand and if dry in that formation will plug below the Big Injun and save the gas.

On the head waters of Green Creek, Walton district, Roane County, the Clifton Oil & Gas Co. has completed the rig for a second test on the G. A. Cummings farm. In Union district, Ritchie County, Ira D. Cox has completed in the Big Injun sand No. 3 on his own farm. In the same district, S. W. Young has a gasser in the same formation at a test on the W. M. McCloy farm.

In the McClellan district, Doddridge County, the Norbell Oil & Gas Co. has completed No. 5 on the J. R. Roberts farm, a gasser in the Big Injun sand. In West Union district, the American Oil & Development Co. has a gasser in the same formation at a test on the A. B. White heirs' farm.

In Sheridan district, Calhoun County, B. J. Crowley has drilled a test on the Charles Barnett farm into the Maxon sand. It is a gasser good for 500,000 feet. On Barnes Run, Lee district, M. F. Crowley has completed in the salt sand a test on the W. M. Sturms farm. It is a 6-bbl. pumper.

In Reedy district, Roane County, the Heck Oil Co. has completed in the Berea grit a test on the F. D. Vandale farm. It is a gasser good for 1,000,000 feet. The location is on Masters Run.

Ritchie County

On McFarlan Creek, Murphy district, Ritchie County, the South Penn Oil Co. has completed in the Big Injun sand No. 8 on the Anna M. Wilson farm. It is a duster. On Lowthers Run, same district, the Hope Construction & Refining Co. has completed a second test on the J. L. Hill farm. It is a duster in the same formation. On Big Ridge, Grant district, the Astron Oil Co. has completed No. 7 on the Herman Stursburg Realty Co.'s property and good for 10 or 12 bbls. a day. in the Big Injun sand.

In Burning Springs district, Wirt County, Roberts Brothers have completed in the second Cow Run sand No. 156 on the Rathbone oil tract. It is a very light pumper. In New Milton district, Doddridge County, the Carnegie Natural Gas Co.'s test on the B. C. Davis farm is a gasser in the Big Injun sand.

West Virginia is completing more gassers than oil wells. In Jefferson district, Pleasants County, Dinsmoor & Co. has now drilled No. 6 on the Calvin Templeton farm through the Big Injun sand. It is dry and abandoned.

Gasser in Lewis County

In Collins Settlement district, Lewis County, Weed Smith and others have a gasser in the Gantz sand at a second test on the James Whelan farm. In Glenville district, Gilmer County, the Sears Oil & Gas Co. has a gasser in the Big Injun sand at a test on the A. B. Campbell farm.

In Ten Mile district, Harrison County, the Clarksburg Light & Heat Co. has completed No. 255 on the Mary E. Bramer farm. It is a gasser in the Gordon sand. In Carroll district, Lincoln County, W. C. Kingery has a gasser in the Berea grit at a test on his own farm.

Test Wells in Defined Territory

In Church district, Wetzel County, the Carnegie Natural Gas Co. is fishing for a bit at 2,100 feet on the J. H. Ott farm. In Ten Mile district, Harrison County, C. Lyons & Co. are building a rig on the Ezra J. Goodwin farm. In Union district, the Reserve Gas Co. is still fishing for casing at 6,834 feet on the Chapman Smith farm.. In Coal district, the Washington Gas Co. has drilled to a depth of 2,374 feet and shut down on the E. D. Fittro farm .

In Grant district, Cabell County, the Harshbarger Oil & Gas Co. has a rig up on the Addison Connar farm.

On Spruce Creek, Union district, Ritchie County, the C. W. McCall Drilling Co. has the rig completed for a test on the C. S. Pearcy farm. In Ten Mile district, Harrison County, the Forno Oil Co. has the rig completed on the J. H. Furner farm. In Grant district, Ritchie County, the Mellon Oil Co. is rigging up on the Charles S. Lewis farm. In the same district, Maxwell & Charter are rigging up on the B. F. Kerma farm.

In Union district, Ritchie County, the Imperial Oil & Gas Production Co. has rig completed for a test on the J. W. Mason farm. On Trace Fork, DeKalb district, Gilmer County, the Hope Construction & Refining Co. has a rig up on the Fred Wilt farm. On the same stream and district, the Hope Natural Gas Co. has a rig up on the Catherine Wilt farm. In the same district, Clem Morris and others are drilling No. 3 on the Margaret Barker farm to the lower sands. The location is 2,000 feet west of the South Penn Oil Co.'s test on the Perry Black farm.

Wood County

In Union district, Wood County, the South Penn Oil Co. is drilling a test on the Nettie M. Dye farm. In Walker district, the Davis Oil Co. is drilling on the Rasel McPeak farm. In Green district, Wetzel County, Carr Brothers have shut down at 400 feet on account of disputed title to the lease on the Stephen Morgan farm.

In Cove district, Doddridge County, Ira D. Cox is making the road to a location on the Levi Spurgeon farm. In McElroy district, Tyler County, J. D. Foley has started to drill on the Rebecca Singer farm. In Batelle district, Monongalia County, the Carnegie Natural Gas Co. is drilling down from the Big Injun sand to the lower sands, No. 1 on the O. L. Talkington farm.

Cabell County

In Barboursville district, Cabell County, the Star Development Co. has started to drill on the W. S. Estler farm. In Grant district, the United Fuel Gas Co. has started to drill on the O. W. and S. J. Miller farm. In Curry district, Putnam County, Wysong & Jaynes are due in the sand on the Roberts-Vanderlinde farm.

In Webster district, Marshall County, S. S. McCracken has made a location on the Joseph Rush farm. In Union district, the Spider Oil & Gas Co. has abandoned its location on the A. Jocum farm. In Clay district, Wetzel County, the Wetzel Gas Co. has a rig up on the W. H. Kimble farm. In Center district, the Hope Natural Gas Co. is building a rig on the Miller Jefferson farm to drill to the lower sands.

Southeast Ohio

In Section 21, Fallsbury Township, Licking County, Sterl C. Brown has completed and shot in the Berea grit No. 6 on the F. L. Baughman farm. It produced 20 bbls. the ensuing 24 hours.

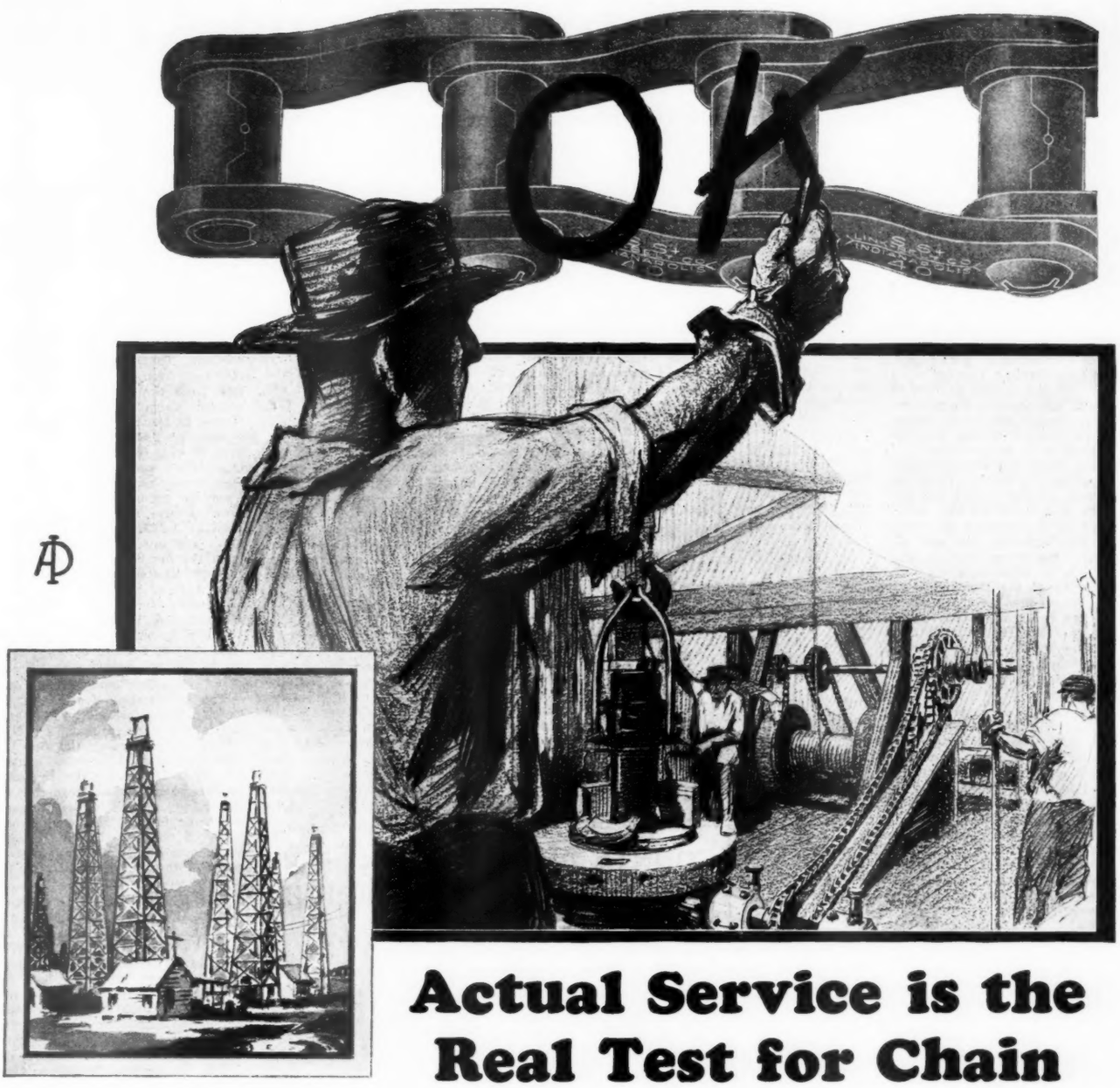
In Lot 7, Section 10, Chatham Township, Medina County, Johnson & McGrath have a light pumper at a test on the Leah A. and Silvis E. Brinker farm. In Lot 5, Section 14, Chatham Township, E. R. Edson Son & Co. have a very light pumper at No. 3 on the William P. Wertz farm. No. 37 on the same farm, and same owners, is dry at a total depth of 370 feet.

In Section 21, Killbuck Township, Holmes County, the Kemrow Company's No. 3 on the Lloyd Souders farm is a gasser. In Section 14, Richland Township, the Ohio Fuel Gas Co.'s test on the Malissa Manchester farm is a gasser in the Niagara lime. In Section 13, Hardy Township, the Empire Gas & Fuel Co. has a light pumper in the same formation at a second test on the William Watt farm. In Section 19, some township, the same company has a 10-bbl. pumper at a test on the Phillip Collins farm.

Washington County

On Second Creek, Section 26, Muskingum Township, Washington County,

(Continued on Page 250)



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Tri-County Wildcat Leasing Active

Tests of Deeper Sands Expected to Produce Better Wells in Ohio-Daviess-Hancock Territory of Kentucky

By Whit

Staff Correspondent, Kentucky-Tennessee

BOWLING GREEN, Ky., Nov. 28.—Most of the activity in Kentucky was in the western division, around Ohio, Daviess and McLean Counties. Probabilities point to the striking of much better wells when the deeper sands in the western portion of Ohio County, the southern part of Daviess County and the eastern portion of McLean County are given a more thorough test. These are the points where the greater activity in leasing and locating of wildcat wells is manifested.

The bringing in of the well by Dimmick Brothers on the Ratliff farm, in McLean County, opened a way for the trade to work and it is working overtime. Because of the distance from the pipe line to the Dimmick well and all of the storage tanks being filled, it has not been possible to learn definitely just what the capacity of the Dimmick well is. According to oil men on the ground, preparations are being made to run a pipe line out to the Hayden well and continue the line on the Dimmick well, as it looks as though this area of the field will soon be producing a large volume of crude.

The Hayden well has not been completed, but when the oil was struck the hole filled up and it has all indications of a good producer. The Hayden farm well is about 5 miles north of the Dimmick well and in Daviess County. The Dimmick well is in McLean County, not far from the Ohio County line. Another test is on the Ohio County side of the line and about 3 miles due south of the Hayden well, making a territory between the three wells, look inviting, and it is held pretty well under lease, only a few straggling pieces not being tied up.

One-half royalty on his farm adjoining the Hayden farm was sold by Alvey Tyler to Homer Thrawley, an oil man, for a price not announced but known to be as much as the farm would have brought before the oil excitement.

Large producers were a scarcity the last week except in Ohio County, where two wells good for 150 bbls., each were found on the Cora Wells farm, and one good for 100 bbls., on the Spence Bartlett farm, all in the Ambrose Pool.

The wildcat on the Bob Hamilton farm, 1½ miles southeast of the Ambrose Pool, in Ohio County, is attracting attention. After passing through 33 feet of sand, the well is reported to have started flowing. This well is midway between the Ambrose Pool and the new Sunnydale Field, Ohio County. It has been estimated at better than 250 bbls.

Another well of interest is on the Lawrence F. Roby 42 acres, northwest of the John Roby farm, and between that farm and the hamlet of St. Lawrence, in Daviess County. It is said to be showing for 100 bbls. initial.

Tri-County Production

An increase of crude oil production for October in the Tri-County Field of Ohio-Daviess-Hancock Counties, of close to 4,000 bbls., over that of September, just made public by the State Tax Commission, jumped the total figures for the month to heights not previously attained and came as a surprise because of the slowing down of pumping by operators owing to the low price of oil.

A total of 161,494.91 bbls. was reported to the state commission for October. The production for September was 157,780 bbls. Ohio County yielded 154,942.81 bbls; Daviess County, 5,054.46 and Hancock County, 1,501.64 in October. Owing largely to the operators exploring new territory fewer wells have been drilled in the old proven fields, and not as many have been brought in, nor were the old wells pumped to capacity as would have been the case had the price of oil been higher.

Week's Work

The summary of the week's work in the Kentucky Field showed 26 completions, 22 producers with an initial production of 664 bbls. and 4 dry holes. Compared with the previous week, there were 13 more completions, 14 more producers, 444 bbls. more production and 1 less dry hole. The wells were distributed by counties and districts as follows:

County—	Comp.	Oil Wells.	Prod.	Dry
Ohio	7	7	510	0
Daviess	4	4	25	0
Warren	3	2	7	1
Allen	2	1	90	1
Estill	5	4	14	1
Lee-Owsley	2	1	10	1
Wayne	2	2	4	0
Johnson-Magnoffin	1	1	4	0
Total	26	22	664	4
Last week	13	8	220	5
Difference	13	14	444	1

Eastern Kentucky

A few scattered completions are reported from the eastern division of Kentucky, none out of the small producer class. In District 2 of Wayne County, Monticello Field, the Somerset Oil Co.'s No. 3 on the H. E. Coffee farm, is less than a barrel from the Beaver sand. In District 3, John Dillons' well on the Eli Phipps, is good for only 2 bbls.

In District 8 of the Irvine Field of Estill County, the Superior Oil Corp.'s No. 22 J. D. Alexander farm is good for 2 bbls.; No. 26, same farm, 5 bbls. Reno Oil Co.'s No. 6, John Goff farm, is dry, and No. 5 of the same company on the Mitchell farm, is a 2-bbl. pumper. Waco Oil Co.'s No. 15 A. J. Rawlings farm, good for 5 bbls. under pump.

In the Beattyville Field of Lee-Owsley Counties, District 20, Crit Childers' No. 5, on his own farm, is good for 10 bbls. under pump. In the Island Creek area, District 37, of Owsley County, the Atlantic Oil Producing Co.'s test, on the Dave Chadwell farm, is reported dry. This well is in close proximity to the good wells found by the Big Injun Oil Co., and the Petroleum Exploration Co., on the J. R. Brewer lease.

In Johnson-Magoffin Counties, Paintsville Field, District 25, the Reno Oil Co.'s No. 9, on the B. F. Conley farm, is a 4-bbl. pumper from the Weir sand.

No report has been given out as to the outcome of the well reported drilling 10 miles south of London, in Laurel County, by the Standard Oil Co. of Kentucky. This well has been shut down for a long period and probably has been discarded.

Western Kentucky

The western division of Kentucky is where the operators are doing their stuff, and they are busy gathering up all available acreage in counties surrounding Ohio County, in hopes of getting some of the good producing areas. Many oil men began looking over the field before the knee-deep mud came. Now it is almost impossible to get over highways that are not macadamized. During the last few days many automobiles have been left along the roads, not being able to move.

The Gainesville area of northeastern Allen County and northeast of Scottsville comes forward again with a good producer found by the Mid-Southern Oil Co., in No. 18 on the General Wood 2,700-acre ranch, along Barren River. This well is reported with an initial production of 90 bbls., from a depth of 248 feet, and rumors are that No. 17 failed to show production.

The Bowling Green Field of Warren County is credited with three new completions. Thompson Oil Co.'s No. 7 well, 200 feet from the north line and 1,350 feet from the west line of the H. M. Bryant farm, southwest of Bowling Green, in District 5, is reported a 5-bbl. pumper at 1,130 feet, which is the deep sand of this field. In the same district, Orin Wood completed his initial test 600 feet from the north line and 650 feet from the east line of the Vanmeeter-Stewart farm, which was dry in the deep sand at 1,226 feet. R. E. Walker also hit a dry one at No. 12 well, 200 feet from the north line and 1,500 feet from the east line of the Henry Bryant farm, same part of the field. Nine miles east of Bowling Green, in the Hardcastle area, McGuigan & Byle's second test on the L. H. Hunt lease, District 4, after given a shot at a depth of 508 feet, showed an initial production of only 2 bbls.

Tri-County Field

The outstanding feature of the Tri-County Field, especially in Ohio County, is the venture made by G. Taylor Yewell and others on the Bob Hamilton 350-acre farm, 1½ miles southeast of the big wells on the Weller farm in the Ambrose Pool and between that pool and the Sunnydale Field, where good wells are being found. This well is on a long strip of territory running north and south and if it proves productive on all parts of the leases it will have room for more than 50 wells.

The drilling is said to be done for the lease owners by the Cumberland Petroleum Co., a recent entry in the new field, and formerly from the Wier sand field in Lawrence and Johnson Counties in the eastern division where the company has a large number of producing wells. The Hamilton well is reported to be making a showing estimated at around 250 bbls. or better, but facts can not be told until it is hooked onto tankage.

The Cumberland Petroleum Co. is said to have contracted with the Yewell interests to put down six wells. The drill in the initial venture went 33 feet into the sand without hitting the bottom of the sand, which indicates that the sand thickens to the southeast of the famous Ambrose Pool.

Another good well reported in close proximity to the Ambrose Pool, is James C. Ellis' No. 3, on the W. Spence Bartlett lease, estimated better than 100 bbls. initially. Daugherty and others' Nos. 8 and 9, on the Cora Wells 130 acres, at the western edge of the Ambrose Pool, are rated as good for 150 bbls. each.

The Globe Oil Co. and others drilling on the Vincent Steele farm, near the town of Bufird, in Ohio County, about 6 miles west of the Ambrose Pool, is reported to have found a showing of oil and shut down for orders. Should this prove a producer of note, it will mean much for the 6 miles of territory. This well is 4 miles south of Pleasant Ridge, and is known as the Chicken farm.

In the Midkiff Pool, Ohio County, the White Plains Oil & Gas Co. has a 15-bbl. initial producer at a test on the Ada Kelly 50 acres. A string of 428 feet of casing was set in this hole, sand at 428 and sent to a total depth of 560 feet and shot with 40 quarts. H. A. Russell and others' No. 2, on the A. P. Kelly 340 acres, in the same pool, set a string

(Continued on Page 246)

AUGLAIZE COUNTY TAKES LEAD IN OPERATIONS IN OLD LIMA FIELD

By Whit

FINDLAY, Ohio, Nov. 28.—In the Lima Field, Salem Township, Auglaize County, a test on the H. Miller is a 15 bbl., initial pumper. In the northeastern part of the same county, near the Hardin County line, in Wayne Township, a test on the M. Gossard, produced an initial of 18 bbls., and helps materially in opening what looks like a new addition to the old Trenton Rock district. Another interesting well is that on the John E. Boyer farm, Washington Township, Sandusky County, in advance of production, and reported as good for 10 bbls.

An interesting strike is that made by the Oko Oil and Gas Co., in No. 15 on the T. W. Brinker farm, Chatham Township, Medina County, where a 30-bbl. well was found in the shallow sand at 340 feet, the best producer there for the past few years.

Completions in Indiana and Illinois were all in defined territory and either light producers or dry holes.

Lima Field

At this time Auglaize County is taking the lead in operations in the old Lima Field of northwestern Ohio. The arrival of cold weather will affect work in all of the producing counties, although the bringing in of a well of magnitude would start a drilling campaign in any part of the field, but the producers found are not encouraging enough to maintain drilling during the extreme winter weather.

Auglaize County is credited with three test wells since the last report and two of them are producers, the other a dry hole. The most interesting one is the test of Arthur & Simpson in the southwest corner of the M. Gossard farm, in the northeast quarter of Section 1, Wayne Township, and in the northeastern part of the county, not far from the Hardin County line and in advance of the Roundhead Field in the latter county. Top of sand was found at 1,457 feet and oil found at 48 feet in the sand at a total depth of 1,505 feet, the well pumping 18 bbls. the first 24 hours. The test of Charles Mertz and others, 500 feet from the north line and 250 from the west line of the H. Miller farm, in the northwest quarter of Section 2, Salem Township, Auglaize County, pumped an initial of 15 bbls. the first 24 hours. Trenton was topped at 1,147 feet and drilled 50 feet in and given a shot. The dry hole in this county was drilled by W. V. Young and others in the northwest corner of the William Doering farm, in the NE of Section 4, Washington Township. Sand was found at 1,170 feet and the well drilled 55 feet in the sand.

Northeast of Lima, C. A. Peavey drilled in No. 8 well, 250 feet from the south line and 850 from the east line of the E. W. Prowant farm, in the SW of Section 1, Bath Township, Allen County, getting a 10-bbl. initial pumper, with sand topped at 1,311 feet and drilled 41 feet in the Trenton.

Between Elmore and Gibsonburg, in Washington Township, Sandusky County, the Lindy Oil Co.'s test in the northwest corner of the John E. Boyer farm, in the SE of Section 11, found the top of the Trenton sand at 1,289 feet, drilled 51 feet in the sand to a total depth of 1,340 feet, the well producing 10 bbls. initial under pump.

The June Oil Co. drilled in No. 3 well, in the southwest corner of the Rice heirs

(Continued on Page 246)

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J477

Field Problems and Their Solution

EDITED BY THOMAS F. SMILEY

In order that men connected with the drilling, producing and transporting branches of the petroleum industry may procure quickly a solution of many problems confronting them from time to time in their work, The Oil and Gas Journal has arranged with leading engineers and other recognized authorities to answer questions submitted by readers of this publication pertaining to the work of drilling and producing crude oil and transporting this product.

Everyone is invited to submit questions freely. These questions will be submitted to proper authorities by Mr. Smiley, who edits the page, and answers, based on the best available information, will be published. Each question should give as much detail as possible, especially where it relates to matters where depths of sands, types of sands and operations on adjoining properties would have a bearing on the problem involved. The source of all questions will be considered as confidential and only initials will be published in connection with the question.

In this connection, The Oil and Gas Journal will be glad to publish articles from field men who have devised new methods or practices which are improvements.

CAUSE OF CORROSION

As you probably know, corrosion is causing us a lot of trouble here in West Texas. Is this corrosion caused by the gas only, or does the sulphur in the oil cause corrosion too? I would like to know what measures have been taken or can be taken to meet the difficulty mentioned.—D. H. J.

Careful and exhaustive study is being made of this subject of corrosion by chemists and engineers, and various experiments are being tried in different parts of the West Texas oil field with a view of finding some practical solution of the difficulties growing out of the high sulphur content of the petroleum produced in your territory.

The greater part of the corrosion results from hydrogen sulphide in the gas, along with water, and not from sulphur in the oil. This seems to be apparent from the fact that although the sulphur content of the oil be high, there is little trouble from corrosion unless the well produces water along with the oil. In other words, the corrosion problem seems to assume serious proportions only where water is produced along with the oil.

The corrosion in tanks is attributed chiefly to reaction of hydrogen sulphide gas and water vapor. Corrosion appears first on the roof of the tank, because of condensation of water vapor on the under side when temperature conditions are favorable. The hydrogen sulphide in the gas goes into solution in the water, and creates the destructive acid compound which attacks the tank.

When the inner side of the roof becomes corroded, the iron solution formed drops to the bottom and there, in contact with the bottom of the tank, it forms a local electro-couple. This sets up a galvanic action which attacks the bottom of the tank. It is found that the sides of the tank, unlike the top and bottom, are not damaged by corrosion, even when the tank contains oil of high sulphur content. This is attributed to the fact that the sides are wet with oil all the time.

One oil company has devised an anti-corrosion procedure, and obtained a patent on it, utilizing the principle involved in the absence of corrosion on the sides of the tank while top and bottom are attacked. Sprinkler heads are fastened along the roof of the tank and oil is circulated continuously through these sprinkler heads at low pressure, thus keeping the roof wet with oil all the time. This is expected to check corrosion at its source, for condensation of water, which starts the corrosive action, should thus be virtually eliminated.

With regard to other measures adopted to stop corrosion, experiments have included trying various kinds of paints, metal coatings and pipe material, but practically no positive results have been achieved thus far. Even lead-covered pipe has failed to solve the problem. When the experimenters find a compound which promises to resist the action of the acid, the compound fails in mechanical features or in the element required to resist abrasion caused by the velocity of flow.

GAS INCREASED BY SWABBING

Why is it that swabbing an oil well results in a greater increase of gas than of oil?—B. R. B.

Swabbing results in a surging of the oil and gas column of the well. The pressure held on the sand by the column of fluid in the hole is allowed to build up between swab runs and then suddenly is released when the swab rapidly lifts the fluid from the well. This causes the surging referred to, which in turn accounts for the gas entering the well at a more rapid rate. It is well known that a flowing well produces more gas per barrel of oil when it reaches the surging stage, which occurs just before the natural flow ceases.

SUBSTANCE ANALYZED

I am sending you a sample of residue I got from a string of tubing that I pulled from a pumping well. When you get this sample I wish you would tell me whether it is paraffin. If it isn't paraffin, can you tell me what it is?—J. H. G.

On casual inspection the gummy mass appeared to be paraffin, but further examination showed it to consist of approximately 25 per cent free carbon, 50 per cent iron oxide and other mineral matter and the remainder wax and binder material. The substance has been deposited in the hole in the process of drilling.

POSITION OF SEPARATOR

I notice that many oil operators place the separator on a platform near the derrick. What is their idea in doing this?—F. K. C.

There are two reasons, both good ones, for placing the separator in this position. In the first place it eliminates all right-angle bends from the flow line, thus reducing to a minimum the pressure at the well head. In the second place it permits gravity flow from the separator to the oil tank. It might be added in this connection that it is becoming a common field practice to have a separator for each individual well.

SHALE OR SLATE

An argument has arisen as to whether a substance we are getting in a drilling well is shale or slate. What is the difference between shale and slate? I will put a bit of the stuff we are getting in the envelop with this letter and I would like to have you tell me what it is, shale or slate.—A. R. M.

The specimen enclosed with your letter is slate. Slate is shale that has been subjected to high temperature or high pressure or to both. The two formations are essentially alike, consisting of the same material. Slate is always more compact, harder and more brittle than shale. Slate usually is found associated with other hard rock formations, whereas shale is found associated with sands, limestones and other sedimentary formations.

HYDROGEN SULPHIDE

How do you account for the presence of hydrogen sulphide in an oil sand? Has anything been published on the subject?—R. McW.

It has been suggested that the presence of an appreciable amount of hydrogen sulphide is usually associated with some out of the ordinary subsurface condition such as unconformities, or faulting, or, close proximity to igneous rocks. To substantiate this, attention is called to the sulphur gas produced in the old Midway-Sunset district in the San Joaquin Valley along the contact of the Maricopa Shale and the Etchegoin, to the Texas Panhandle, to the West Texas area, and to the Chickasha Gas Field, in Oklahoma. In all of these areas it is suggested that sulphur vapors originating below the producing horizon and possibly of igneous origin have migrated along faults and unconformities into the oil bearing formations. U. S. G. S. Bulletin No. 653, published in 1917, entitled "Chemical Relations of the Oil Field Waters in the San Joaquin Valley" by G. Sherburne Rogers, deals with the occurrence of hydrogen sulphide in oil sands. Copies may be obtained by writing to the superintendent of documents, Washington, D. C.

SIZE OF COMPRESSOR

What size of a compressor would you recommend for gas-lift work?—M. P. J.

Your question is a rather difficult one to answer because of the fact that so many factors must be considered. Small size compressors allow for greater flexibility in operation. Plant capacities can be reduced at more frequent intervals as gas or air requirements become less, and equipment no longer needed can be removed to other fields. While these advantages attend the use of small compressors, it should be pointed out that on the other hand larger units may be operated at lower cost. They also may be employed in repressuring the oil sand. In some places the life of a plant on gas-lift work may be only six months, whereas in others the plant may be in use for several years.

TROUBLE FROM HEAVING SAND

I am having trouble in drilling through a heaving sand with cable tool. Can you tell me how I might carry casing through the heaving sand?—D. H. J.

It is suggested that you use a swinging spider in connection with circulating mud fluid. You are likely to have more success by circulating down the outside of the casing and up the inside while drilling.

EFFECT OF BACK PRESSURE ON WATER

Is it true that holding back pressure on a well prevents water from coming into a producing oil well? What amount of back pressure can be held on a well?—O. P. T.

Numerous examples may be cited to show that holding pressure on a well aids materially in preventing water from entering it. This is particularly true of wells located down the structure, where water usually first appears in the wells. In Mexico, where the oil is produced by hydrostatic head, producing oil wells often are drowned out overnight by water when produced at too rapid a rate.

The answer to your other question depends upon factors difficult to determine without experimentation at the individual well. A phase that must be considered is the possible result of an operator on adjoining property permitting his wells to produce at atmospheric pressure. Instances are known where pressures held on line wells resulted in a longer flowing life than that occurring in offset wells which were produced without pressure being held. The type of producing formation, location on the structure, proximity to edgewater and type of oil are important factors to consider. For this reason it is advised usually that back pressure be restricted to inside wells or isolated wells, the line wells being allowed to produce at atmospheric pressure. The problem involved here may be obviated of course by neighboring operators agreeing to employ the same back pressure.

WATER STRING "GOES BAD"

We have had considerable trouble resulting from the bottom joint of the water string going bad on us. How can we eliminate this difficulty?—A. H. E.

Your difficulty may be overcome by using heavier casing on the bottom three joints or by spotwelding a slightly larger size over the bottom three joints of the water string, for example 9-inch over 8¼-inch.

CHATTANOOGA SHALE

Can you tell me whether the Chattanooga shale found in Kentucky is related to the Genesee shale of our state (New York)? Is gas ever found in this formation? I would like to know something about this shale.—T. J. K.

The Chattanooga shale of the Upper Devonian age is regarded as of importance as a key rock and furthermore it may become of distinct commercial value because of its rich oil content suitable for recovery by distillation. This shale is found not only in Kentucky, but in Tennessee and Oklahoma also, extending westward from eastern Tennessee. In Allen, Barren, Floyd and Meade Counties, Kentucky, gas in commercial volume has been found in this shale. It seemingly is the equivalent of the Genesee shale of your state, and of the Ohio shales of Ohio and the New Albany shale of Indiana. The characteristics of the four shales are virtually identical. It is a brittle, crisp, black bituminous shale, differing from the shales above and below it. The Ridgetop shale of the Lower Mississippian age overlies it in Tennessee and the Boone chert overlies it in Oklahoma. It is underlain by limestones or the Claremore sand.

SAMPLE IS CEMENT

I am sending you a sample of some stuff which was brought up in the bailer while we were cleaning out a well. I am not sure what it is. Can you tell me?—P. W. A.

The specimen you sent is a bit of cement that had not set properly. It is probable that gas was present when the cement was placed in the well. This would account for the large pores, formed as the gas bubbled through the fluid cement. The light weight of the sample also is indicative of its being cement.

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MEN KNOWN IN OILDOM

Herbert G. Eaton

Although he was born in Clapham, Bedfordshire, England, Herbert G. Eaton, refiner, banker, and active churchman of Warren, Pa., probably has rather blurred memories of his native country, for he was only 6 years old when he came to the United States with his parents, four older brothers and his younger sister. For the next 18 years he resided in Reno, Venango County, Pennsylvania. There he attended the village school, of which for a time Peter M. Speer, now general solicitor for the Standard Oil Company of New York, was a teacher. Afterward he attended the Oil City, Pa., high school, 3 miles distant. Incidentally, one of his high school mates was Harry M. Haldeman, now a wealthy resident of Los Angeles, Calif., and president of the Pacific Pipe & Supply Company. Reno was one of the early oil towns of western Pennsylvania and young Eaton grew up in an atmosphere of oil. There were two refineries in the village.

The first steady job held by this young man, who later was to become one of the most widely known oil refiners, was in the village store conducted by the Reno Provision Company. Here he made himself generally useful and gained an insight into the mercantile business which was to be of use to him in after years.

Going to Warren in 1891, he served as chemist and oil tester for the Glade Oil Works until 1900, when he helped to organize the Superior Oil Works. A few years later he aided in the organization of the Mutual Refining Company. He has been the active head of these Warren refining concerns since their beginning and now is general manager and treasurer of each.

Mr. Eaton has been recording secretary of the National Petroleum Association since its organization 25 years ago. He is a director of the Pennsylvania Grade Crude Oil Association and of the Levi Smith Refining Company, Clarendon, Pa.; president of the Riverside Acid Works, Warren, and president of the Conewango Trust Company, Warren. Always interested in civic affairs, Mr. Eaton served as councilman of Warren for two years, resigning in 1908, when he was elected burgess. He served one term in the latter office. Mr. Eaton from young manhood has been active in the affairs of the Methodist Episcopal Church. He is a member of the official board of the first church of Warren and in 1924 he served as a delegate to the general conference of his denomination.

PERSONAL PARAGRAPHS

Edward Carruthers, independent producer of Tulsa, Okla., has returned from a visit to the oil fields of Michigan.

David Day, refinery engineer of the Richfield Oil Company, was up at Berkeley, Calif., last week.

* * *

Thomas Johnstone, who has been spending a few weeks in Petrolia, Ontario, will return shortly to the Texas fields.

* * *

A. O. Jennings, president of the Illinois-Alberta Oil & Refining Company, of Calgary, Alberta, is visiting in Chicago.

* * *

J. C. McCue, of The Texas Company's Houston, Tex., headquarters, was a visitor to the Shreveport, La., offices.

* * *

Frank Phillips, president of the Phillips Petroleum Company, of Bartlesville, Okla., has returned from a trip to Europe.

* * *

William Lilley, sales manager for the Forrest E. Gilmore Company, of Tulsa, Okla., was in Shreveport, La., on business.

* * *

Bill Hanrahan, sales manager of the Gaso Pump & Burner Company, of Tulsa, Okla., is making a trip through the Texas fields.

* * *

J. H. Russell, independent operator with headquarters at Vernon, Tex., visited his family in Shreveport, La., during the week.

* * *

Walter and Clarence Nelson, independent oil producers of Fort Worth, Tex., have been visiting at their former homes in Tulsa, Okla.

* * *

R. A. Broomfield was recently elected president of the Barnsdall Oil Company of California in recognition of his exceptional service in California.

* * *

T. C. Moss, of Dallas, Tex., representing the American Tank Car Corporation, called on refiners in Shreveport, La., territory during the past week.

* * *

M. J. Grogan, vice president of the Louisiana Oil Refining Corporation, of Shreveport, was in Fort Worth and Dallas, Tex., several days on business.

* * *

W. L. Richards, of Laredo, Tex., has spent six months doing geological research work in West Texas, traveling 16,000 miles by auto. He is now in Laredo.

* * *

G. H. O'Donnell, purchasing agent for the Continental Oil Company, northern division, has returned to Casper, Wyo., after a visit in New York City and Princeton University.

* * *

F. E. Holbrook, formerly of Petrolia, Ontario, has been appointed assistant secretary-treasurer of the International Petroleum Company, of Toronto, succeeding the late J. R. Polley.

* * *

M. E. Wilson, manager of the production department of the Louisiana Oil Refining Corporation, spent a week at Allen, Okla., where the corporation has considerable production.

* * *

A. V. Bourque, secretary of the American Association of Natural Gasoline Manufacturers, is back at his headquarters in Tulsa, Okla., after a trip through the Texas fields and California.

* * *

Bert Stickles, G. R. Stewart, J. A. Palmer and Tom H. Hunt, of Bowling Green, Ky., have been looking over the Tri-County Field of Ohio-Daviess-McLean Counties, in western Kentucky.

* * *

Edward Durham, of Sistersville, W. Va., of the Midwest-Wyoming Gas Company, spent several days in Casper, Wyo., in conference with officials of the Midwest Refining Company. The Midwest-Wyoming Gas Company furnishes a number of towns in the Big Horn Basin with natural gas.

* * *

R. E. Ellison, vice president and general manager, and A. W. Peake, superintendent of operations for Midwest Refining Company, were in Denver, Colo., attending a meeting of the directors.

* * *

J. J. Conry, general superintendent of the Carter Oil Company, has left for Los Angeles, Calif., where he will make an inspection of the Pacific Coast fields, returning to Chicago, Ill., in time for the annual convention of the American Petroleum Institute.

Frank Lefevre, who with John Storey brought in the discovery well in the Lytton Springs Field in Caldwell County, Texas, spent several weeks in New York and the East and is now back in San Antonio.

* * *

G. S. Rollins, formerly general superintendent of the Roxana Petroleum Corporation, has been transferred to St. Louis, Mo., and made executive head of the producing branch of the Roxana interests.

* * *

Norval White, Pacific Coast representative of the American Petroleum Institute, was in Los Angeles, Calif., as an official representative of the Institute at the meeting of the California Natural Gasoline Association.

* * *

Carl Jones, F. A. Rice, of the Humble Oil & Refining Company's land department at Shreveport, La., and Dr. W. S. Harman, spent the end of the week in the Calcasieu marshes near Lake Charles on a goose hunt.

* * *

E. L. Doheny has returned to Los Angeles, Calif., following a trip to Sacramento, Calif., where he was the successful bidder on 160 acres of government land which was secured by the Pan American upon his authorization.

* * *

John McFadyen, vice president and director of Ohio Oil Company, in charge of operations for the company in the Rocky Mountain region, is looking after drilling operations in California. During his absence Mrs. McFadyen and their daughter, Miss Helen, are visiting relatives in Ohio.

* * *

Hale B. Soyster, supervisor of the conservation department of the United States Geological Survey, and vice president of the Association of Petroleum Conservation Bureaus, of Muskogee, Okla., is in Shreveport, La., checking a number of tracts of government lands in that territory.

* * *

A. T. Coumbe, assistant economist, United States Bureau of Mines, has been transferred from Washington, D. C., to the Petroleum Experiment Station, Bartlesville, Okla. Mr. Coumbe is making an economic survey of the uses of petroleum products in the Mid-Continent area.

* * *

Bonneau Peters, chief scout for the Standard Oil Company in North Louisiana, South Arkansas and East Texas, and Hugh Austermel, of the Standard Pipe Line Company, were among the Shreveport, La., delegation going to Houston, Tex., for the Centenary-Rice football game.

* * *

President E. J. Marston, D. J. Donahue and General Manager R. J. Fleckenstein, of the Texas Pacific Coal & Oil Company, have left Great Falls, Mont., for California after touring the Sunburst Field and looking over the holdings of the Homestake Exploration Company, the subsidiary of the Texas Pacific company.

* * *

Charles D. Wagner, vice president and sales manager of the Emsco Derrick & Equipment Company of Los Angeles, Calif., recently spent a week in the northern California districts on business. W. A. Trout, vice president and general manager of the same company, is making a tour of the Mid-Continent, Texas and eastern oil fields. E. M. Smith, president, Emsco Derrick & Equipment Company, is on a business trip to the New York office.

* * *

Among outside operators who have been going over the Ohio-Daviess-McLean-Hancock Counties fields, making headquarters at Owensboro, Ky., the past few weeks were: O. A. Strader, Clarksburg, W. Va.; S. A. Slagel and J. W. Warner, Cleveland, Ohio; F. W. Evans, Lexington, Ky.; Samuel Chenault, Mount Sterling, Ky.; George McGinley, Gorin Steen, W. P. McLaughlin and H. L. Miller, Bowling Green, Ky.; W. F. Lange, Marion, Ind.; Dewey Cordle, Blaine, Ky.; Paul A. Harsch, Toledo, Ohio; D. K. Holmes, Fremont, Ohio; W. C. Parmalee, Cleveland, Ohio; H. G. Beatty, Ashland, Ky.; George Ferrell, Monticello, Ky.; W. C. Dodson, Jack Dodson and Duncan Dodson, Scottsville, Ky.; W. E. Hupp, J. S. Smith, and A. J. Gilbert, Lexington, Ky.; Carmiel Dodson, Monticello, Ky.; H. E. Belcher, Ida May, Ky.; O. H. Tracey, Bridgeport, Ill.; A. J. Fause, Lawrencevill, Ill.; R. Maybier, Toledo, Ohio; E. E. White, Paintsville, Ky.; Dan McQueen, Louisa, Ky.; W. B. Garrison and Charles Garrison, Lawrenceville, Ill.

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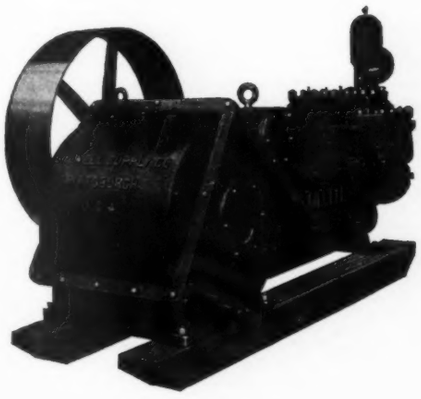

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Natural Gas Developments

Exhausted Osage Gas Field Becomes Storage Reservoir

By J. L. Dwyer

At a time when gas conservation is receiving more attention than ever before, the Osage Nation of Oklahoma furnishes an interesting sidelight upon this phase of oil and gas development.

The Osage Indian Agency always has functioned with a model conservation organization. The Agency oil and gas inspector and his aides watch all parts of the field, and exercise a constant vigilance in the interest of oil and gas conservation. The result is that in this field conditions are conducive to unusually careful handling of all gas production.

In handling the tail gas from a series of natural gasoline plants in the Burbank Field, an excellent example of gas conservation and a perfect natural reservoir for gas may be observed in the Tidal Oil Co.'s blanket gas lease which covers the east half of the Burbank Field.

Under the leasing conditions peculiar to the Osage lands, the gas lease and the oil lease are entirely distinct. The oil leases are periodically offered at public auction, and generally comprise tracts of 160 acres. The gas leases are for long periods of time, and are awarded in larger parcels, and their owners therefore have little to fear from the migratory nature of any gas deposits.

The Tidal Oil Co.'s blanket gas lease is upon 168,000 acres of Osage lands, including Townships 26-27-28-28 north and Ranges 6 and 7 east. This forms a strip 12 miles wide running from a point 8 miles west of the city of Pawhuska clear to the Kansas line. It takes in the east side of the Burbank Field. Under the lease stipulations the gas lessee is entitled to all natural gas found in the land covered by his lease, and also is entitled to any residue gas which may be running

(Continued on Page 319)

COMMITTEE WILL STUDY WATER IN CARTERSVILLE

SHREVEPORT, La., Nov. 26.—So acute has become the water situation in the Cartersville gas district of northern Bossier Parish that at a conference of operators in that field a committee was appointed to study the situation and make recommendations how best to handle the emergency and produce the wells so as to prolong their life to a maximum length of time.

Most wells in that territory have made varying amounts of water on completion, but of late the amount has been increasing and the flow has also been steadily growing larger in the older wells until it has reached alarming proportions. At the operators' conference, called by W. F. Chisholm of the State Department of Conservation, a cut in maximum withdrawal from each well was proposed and discussed, but it was later decided to try siphoning, though final decision was left to a committee composed of George Belchic, Northwest Louisiana Gas Co.; Herbert Otis, Bethany Oil & Gas Co.; John Woodley, Woodley & Collins; Jack Nash, Atlantic Oil Producing Co., and Mr. Ward, of the Magnolia Petroleum Co.

The Cartersville area presents a rather unusual situation in that the producing sand appears to be almost flat, with cap rock varying in thickness from 9 feet to nothing at all, leading to the belief in some quarters that it is a lenticular sand such as is found in the Urania Field. This, perhaps, may account for the rapid encroachment of salt water, as the wells have not been pulled on hard enough or long enough for them to go to water so soon under ordinary circumstances.

METHODS OF MIXING NATURAL AND MANUFACTURING GAS DESCRIBED

By H. E. Merrill*

Manager Artificial Division, Republic Light, Heat & Power Co., Ltd., Tonawanda, N. Y.

The American Gas Association testing laboratories expect to make some 5,000 tests on mixing gas and its efficiency, to be run over a period of five years. The report of the association's committee on mixed gas for this year showed it was rather hesitant on making any definite conclusions about mixed gas. There are, however, at the present time 14 different companies mixing various kinds of gases and supplying the mixture to the public, as follows:

Republic Light, Heat & Power Co., Tonawanda, N. Y.; Louisville Gas & Electric Co., Louisville, Ky.; Union Gas & Electric Co., Cincinnati, Ohio; Hope Natural Gas Co., Hastings, W. Va.; Elmira Water, Light & Railway Co., Elmira, N. Y.; Pavilion Natural Gas Co., Pavilion, N. Y.; Laclede Gas Light Co., St. Louis, Mo.; Lone Star Gas Co., Fort Worth, Tex.; East Ohio Gas Co., Cleveland, Ohio; Iroquois Gas Co., Buffalo, N. Y.; Houston Gas & Fuel Co., Houston, Tex.; Houston Gulf Gas Co., Houston, Tex.; The Texas Company, Port Arthur, Tex.; Central Indiana Gas Co., Muncie, Ind.

I presume that the kind of mixed gas this meeting is most interested in would be that of natural gas mixed with a manufactured gas which would take care of the inadequate supply of natural gas in the territories where shortages occur either due to increase in the number of customers or to the decrease of the natural gas from the fields.

Before preparing this paper I corresponded with several of the gas companies who are mixing natural gas and manufactured gas for their customers.

Our company has two mixing stations, one in Tonawanda, the other in Batavia, where we mix natural and manufactured gas. I will not attempt to make any recommendations but will merely pass on to you the experience we have had, also the experience of those who have replied to my questionnaires.

It is commonly understood that a uniform specific gravity is the determining factor of good service from mixed gases. To secure the delivery from day to day through uniform orifices at uniform pressures of a constant quantity or flow of any standard quality of gas, it is necessary that the specific gravity be made and kept uniform, since the flow of gas through an orifice is uniformly proportional to the square root of the gravity of the gas.

Method of Mixing

In our case we mix 1,100 B.t.u. natural gas with a 537 B.t.u. by-product coke oven gas. The specific gravity of the natural gas averages from .65 to .72, while that of our coke oven gas varies from .34 to .38. We find that there is a direct ratio between the specific gravity and the B.t.us. of the mixed gas. In order that we may furnish our customers with a mixture which will give them uniform service, we try to carry the mixed gas at a constant heating value. We have found from past experience that we will not have very many complaints from our customers providing that the heat units do not drop less than 75 from the average or standard established and go more than 150 above the average. Due to the high hydrogen content in our coke oven gas, we find that when gas burners are adjusted for a certain mixture and the heat units drop it means that the amount of manufactured gas has been increased and the tendency is for the gas to backfire in the mixture. This is due to the high flame propagation of hydrogen. While on the other hand, if the heat units increase and we have a large amount of natural gas in the mixture the only trouble we have is that the gas will blacken the cooking utensils, due to the flame being underventilated. The latter trouble is not as serious as the first. We, therefore, can vary our heat units over a larger range above the average than below it.

We are using the Thomas recording calorimeter which determines the heat units in our case. Attached to this calorimeter are certain mechanical and electrical devices which operate a valve allowing more or less natural gas to be mixed with the manufactured gas as is required to give an average of whatever B.t.u. gas we wish to deliver to our customers. This machine operates automatically.

At this time I would like to read some extracts from letters received from other companies who are mixing natural gas with manufactured gas.

Elmira Experience

The following is from the Elmira Water, Light & Railway Co. of Elmira, N. Y.

"The gases which are mixed are blue water-gas of approximately 270 B.t.u., 62 Sp. gr. and natural gas of 1,180 B.t.u., 71 Sp. gr. When these two gases are mixed in such proportions as to give a 537 B.t.u. mixture the gravity and other important qualities happen to be fairly close to those of carbureted water-gas. Consequently we are enabled to supplement an inadequate supply of natural gas in winter by adding any required percentage of carbureted water-gas.

"Mixing gas takes place by simply putting the proper proportions of the two gases together in a pipe which discharges the mixture into a gas holder. There is no necessity whatever for any special equipment such as baffles, cyclene effects, etc., to secure the thorough mixing of the gases in the pipe. They cannot be prevented from becoming a homogeneous mixture providing the proper required proportions are discharged into the pipe at every instant. It is highly important, therefore, that the correct proportions of the gases being mixed be discharged into the mixing pipe at every instant. Otherwise there will be a slug of mixed gas of off-value which will pass along the pipe, retaining its off-value throughout, unless it is discharged into a comparatively large body of gas such as would be contained in a holder.

"Of course, under ordinary conditions a holder would be expected to even off any irregularities in the gas entering it so that gas coming out of the holder would show a constant quality. This may or may not be the case, however. There is a very definite current of gas flow inside a holder when gas is being pumped into it. This current is caused by the velocity of incoming gas issuing from the standpipe and may be pictured as passing up to the crown, across and down at a point just opposite from the inlet standpipe. Due to this circulation the evening-off quality of a holder may

(Continued on Page 324)

*Before the Natural Gas and Petroleum Association of Canada at Windsor, Ontario.

CARBON BLACK PLANT FOR SKELLYTOWN, TEX.

Work on the new factory which the Godfrey L. Cabot, Inc., is constructing at Skellytown, Tex., is progressing rapidly and it is expected the plant will start operations early in December. The Santa Fe Railroad completed on October 26 the 12 miles of railroad which serve this plant, and this means that the Cabot construction force expect to get the plant in operation within five or six weeks of the date on which heavy materials were first received. About 250 men are being employed by the Cabot company in their construction gang.

It is expected that by midwinter the plant will be producing over 25,000 pounds of carbon black daily, and plans have been made to double the capacity of the plant on very short notice, whenever the market condition shall justify it.

Innovations in the plant include welded tables, the Duerr air separator, electric drive, belt conveying and gravity conveying, a new type of packer and a new type of press. It is expected these will lower the producing cost and improve the quality.

PARALLELING GAS LINE TO CARTWRIGHT FIELD

SAN ANTONIO, Tex., Nov. 26.—Houston Pipe Line Co. has started construction of a 12-inch gas line from the Cartwright Field in Live Oak County to the Cole Field paralleling the 12-inch line it has had in operation for more than a year. About 15 miles of the new line is completed at the Cartwright Field end.

Southern Gas Utilities has completed its 55 miles of 8-inch gas line from San Antonio to New Braunfels and Seguin and was testing it. The distributing systems are more than 75 per cent completed at New Braunfels and Seguin and are expected to be ready to begin operating early in December.

Austin Gas Co., which owns the distributing system at Austin, Tex., has completed the surveys from Austin to New Braunfels for its 10-inch line and will receive natural gas from the Southern Gas Utilities there as soon as it has constructed its line.

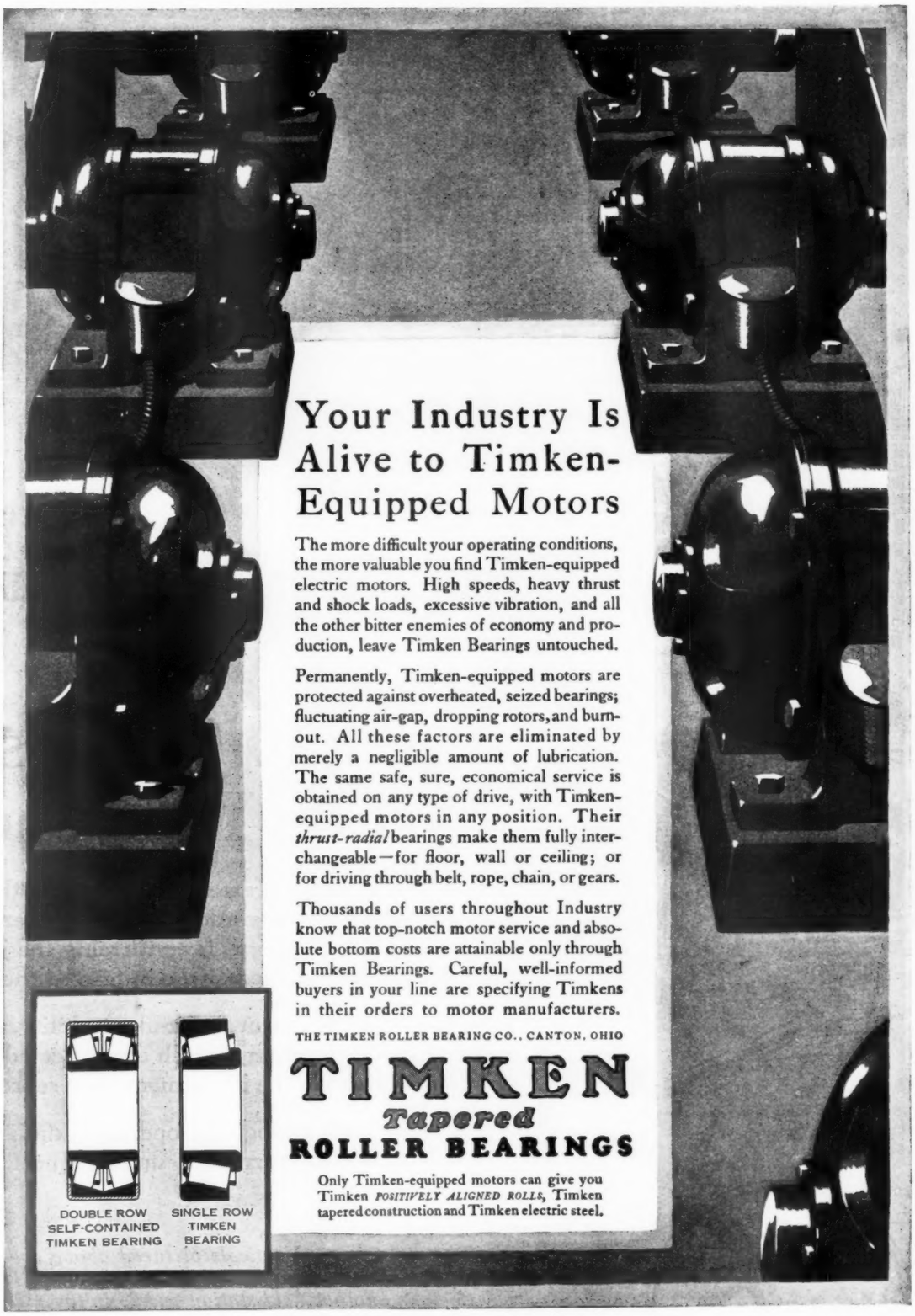
F. A. Hornaday of San Antonio has been given a franchise to furnish natural gas to Big Springs in Howard County. He has purchased a supply of gas in the Chalk Field in southern Howard County and will build a 17-mile pipe line to Big Springs and a distributing system in the town of Big Springs. Mr. Hornaday until lately owned a gas line from Gas Ridge west of San Antonio to San Antonio, which he sold to Southern Gas Utilities.

MORE GAS FOR ELECTRICITY

While decreases from the 1926 level are shown for the consumption of coal and oil, the average daily consumption of gas in the production of electricity, by public utility power plants in the United States for September, 1927, is shown to be the largest in the last eight years, according to the Geological Survey, Department of the Interior. The survey estimates it at 218,600,000 feet. The estimate for September, 1926, is 163,600,000 feet. During September, 1927, 58,499,000 kilowatt hours of electricity were produced in Oklahoma by fuels. The use of fuels in this production was distributed as follows: Coal, 33,736 short tons; fuel oil, 11,647 bbls.; and natural gas, 774,698,000 feet.

NEW LINE AT LONG BEACH

The Signal Gasoline Co., realizing the potentialities of deep sand drilling at Long Beach, Calif., started augmenting its facilities a few days ago, present plans calling for an additional 15-inch gas line from one end of the field to the other. Upon completion of this new line the company will be able to cope with almost any condition which may arise, as it will be possible to divert natural gas production to any one of the company's several plants in the Long Beach Field.


Your Industry Is Alive to Timken-Equipped Motors
The more difficult your operating conditions, the more valuable you find Timken-equipped electric motors. High speeds, heavy thrust and shock loads, excessive vibration, and all the other bitter enemies of economy and production, leave Timken Bearings untouched.
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Only Timken-equipped motors can give you Timken POSITIVELY ALIGNED ROLLS, Timken tapered construction and Timken electric steel.
DOUBLE ROW SELF-CONTAINED TIMKEN BEARING
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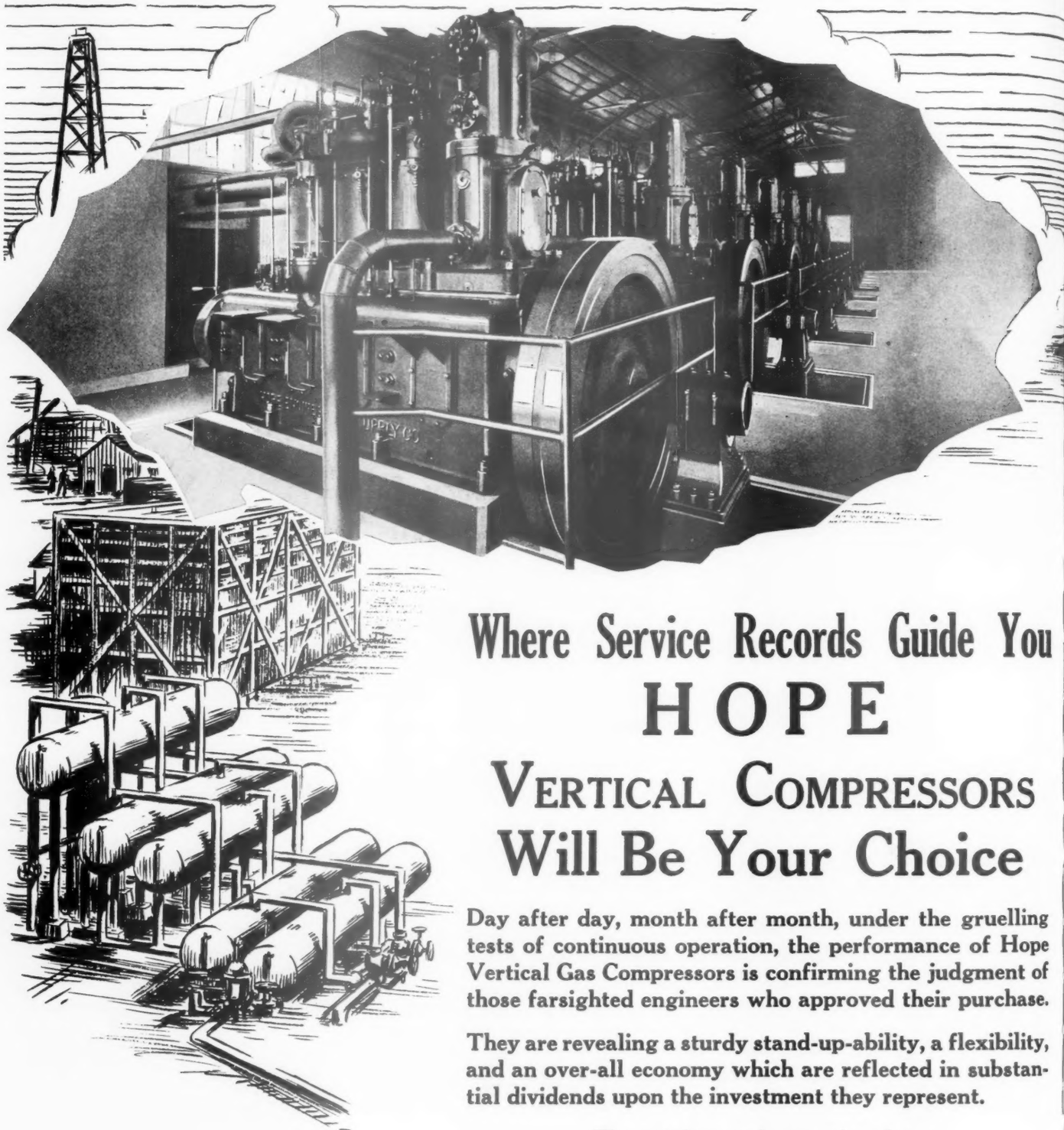

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VERTICAL COMPRESSORS Will Be Your Choice

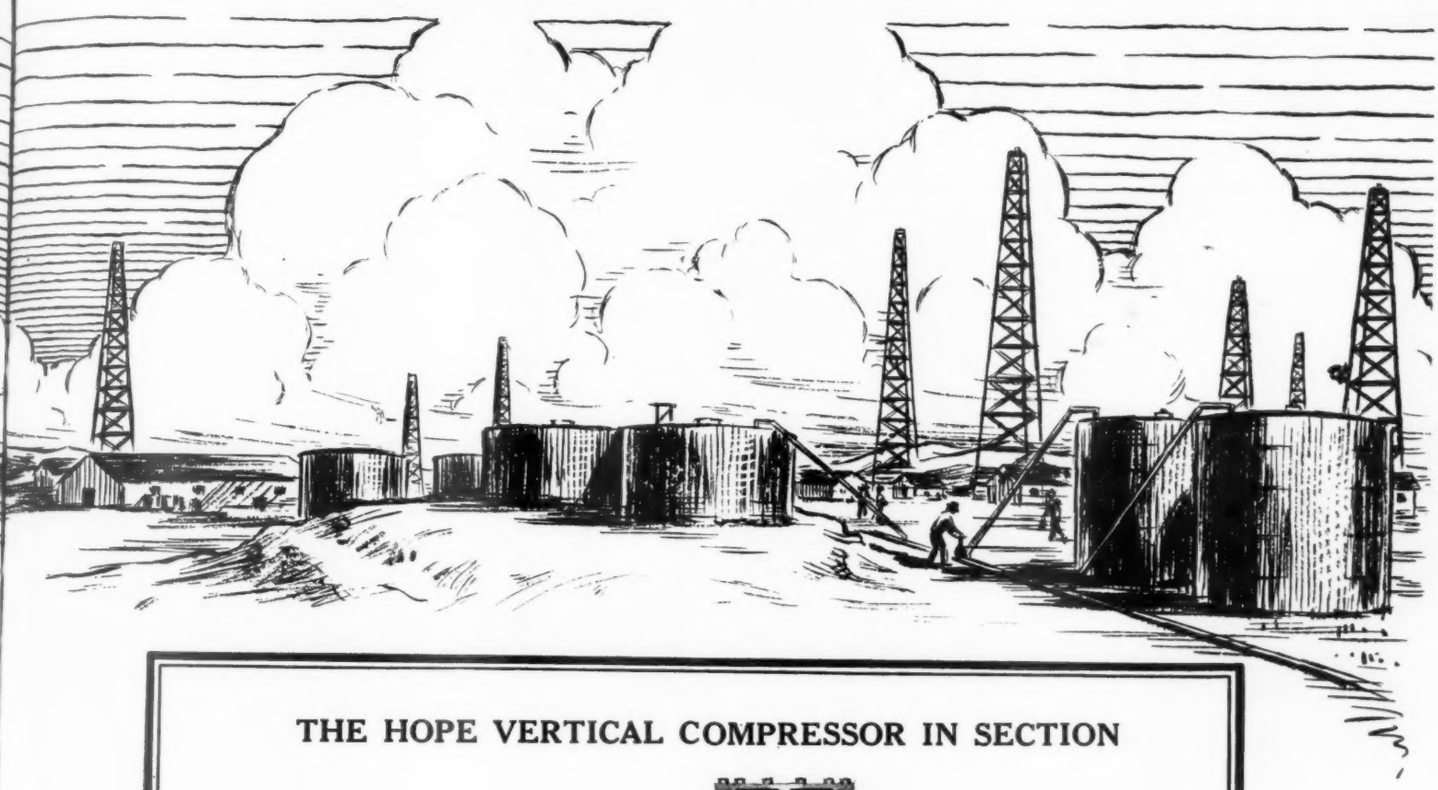
Day after day, month after month, under the gruelling tests of continuous operation, the performance of Hope Vertical Gas Compressors is confirming the judgment of those farsighted engineers who approved their purchase.

They are revealing a sturdy stand-up-ability, a flexibility, and an over-all economy which are reflected in substantial dividends upon the investment they represent.

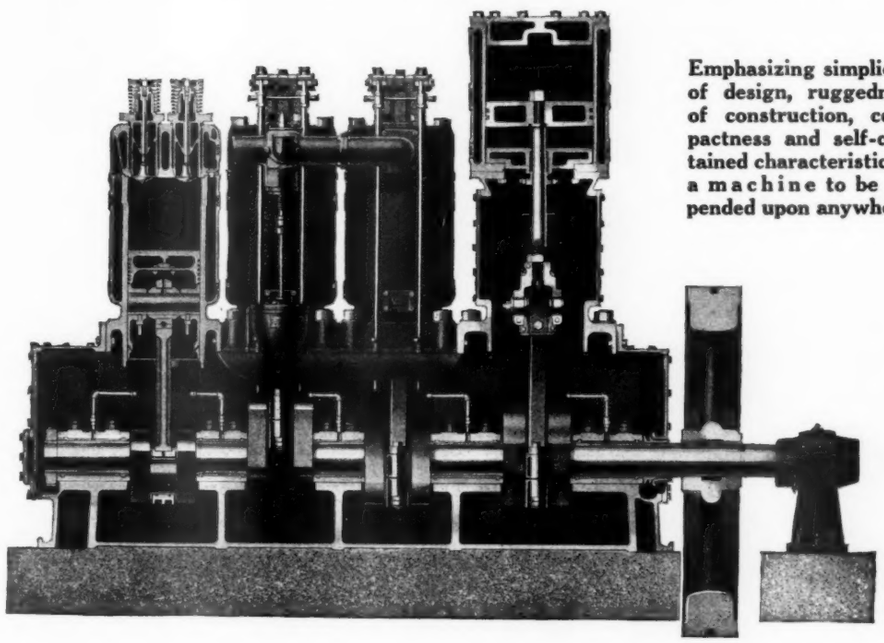
The catalog, and operating data,
will be furnished upon request.

oOo

The eight Hope Verticals pictured above are in a field station of a company which also uses four Hope Verticals in another field station and 24 in the main line station—36 Hope Verticals in all, on one pipe line system.



THE HOPE VERTICAL COMPRESSOR IN SECTION



Emphasizing simplicity of design, ruggedness of construction, compactness and self-contained characteristics—a machine to be depended upon anywhere.

HE-44

ENGINEERS CONTRACTORS

HOPE

ENGINEERING AND SUPPLY

COMPANY

DESIGNERS MANUFACTURERS

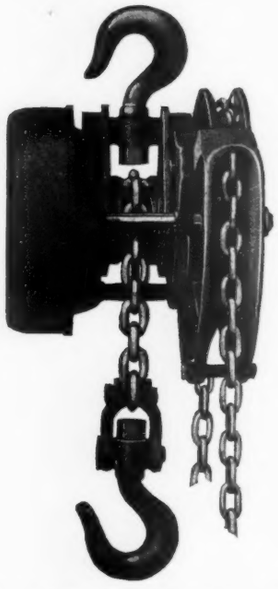
MOUNT VERNON, OHIO, U.S.A.

DALLAS, TEX. TULSA, OKLA. CASPER, WYO.

EQUIPMENT AND SUPPLIES

HOIST HAS PLANETARY ADJUSTMENT OF GEARS

The gear arrangement in the "Ideal" Spur-geared Hoist, manufactured by the Dickerman Hoist Manufacturing Co. of Cleveland, is said to be simple, compact and efficient. It is of the "planetary" type, the name being derived from the fact that the rotating movement of the gears around a central pinion suggests the revolving movement of planets in a solar system around the sun.



An endless hand chain passes over a hand wheel which turns on the screw hub of a ratchet friction disk keyed to a one-piece drive shaft and pinion. This pinion meshes with two gears held diametrically opposite each other in a pinion cage which is secured—by double keys—to the load wheel that carries the load chain.

Integral with these gears are intermediate pinions that mesh with a large internal gear and serve as a fulcrum to rotate the planetary gear. A pull on either side of the hand chain loop causes the drive pinion to rotate the gears in opposite directions, thus causing their pinions to travel around the internal gear revolving the pinion cage and load wheel, thereby raising or lowering the load.

When the pull on the hoisting side of the hand chain loop is discontinued a pawl engages the ratchet disk preventing the load from lowering.

A pull on the lowering side of the hand chain unscrews the hand chain wheel from the hub of the ratchet disk, thus releasing the drive shaft permitting the weight of the load to rotate the planetary gear. The downward speed of the load is always in ratio with the rapidity with which the operator overhauls the hand chain.

The lowering movement continues until the pull on the lowering side of the hand chain loop ceases, when the revolving of the ratchet disk causes it again to screw into the hand chain wheel stopping the movement of the load.

TRANSFERRED TO LANCASTER

The Lincoln Electric Co. announces the transfer of R. P. Nick from the Baltimore, Md., office to the Lancaster, Pa., office, where he will be in charge of the sale of "Linc-Weld" motors and "Stable-Arc" welders.

AIR-COOLED ENGINES STAND RIGID TESTS

A significant development in mechanical engineering is the rapid advance of the air-cooled engine. In the aeronautical and stationary engine industries particularly, this type of motor has made unusual progress.

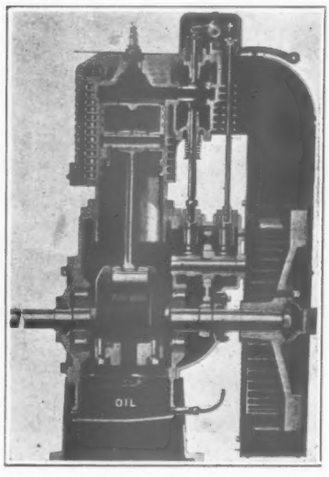
Seven standards of airplane motor efficiency have been established by the Aeronautical Bureau at Washington, D. C. They are (1) low weight per horsepower; (2) high economy in fuel; (3) maximum dependability; (4) maximum durability; (5) maximum ease in maintenance; (6) minimum cost; and (7) easy adaptability to quantity production. According to Commander E. E. Wilson, U. S. N., head of the engine section of the bureau, the air-cooled motor has proved superior in all seven respects.

In one government test, a 500-horsepower air-cooled motor outperformed a 725-horsepower water-cooled engine. The higher-powered water-cooled motor required 2,000 pounds of fuel to 1,350 pounds for the air-cooled, while the latter proved equal in speed and superior in climb and ceiling.

Other tests cited by Commander Wilson indicate that the air-cooled motor has greater "dependability," greater "durability" and greater "ease of maintenance."

During the past 20 years, the New-Way Motor Co. of Lansing, Mich., has been manufacturing, developing and improving the air-cooled engine for general use.

The intake is provided with an air cleaner. The engine is entirely closed and dustproof; every working part runs in a



bath of oil. Speed is regulated instantly, and a convenient lever controls the mechanism of the implement being operated. A Bosch magneto and impulse starter, and a float valve feed carburetor make for easy starting and give a steady, smooth, almost vibrationless flow of power.

"New-Way" engines operate economically on gasoline, kerosene, natural gas, benzine, distillates or alcohol.

PUMPS AT POWER SHOW

The Worthington Pump & Machinery Corp. will have on display at the Power Show in New York December 5 to 10 its new high-pressure, multi-stage centrifugal pump for boiler feeding and similar high-pressure jobs. The upper case will be removed, showing the construction of the volute diffuser. The pump is hydraulically balanced and has single suction impellers, all end thrust being taken by the hydraulic balance disc.

Another new Worthington product to be displayed is the 4-inch three-stage special oil line pump already in use in the oil fields. The pumps are placed two in series, directly in the line, giving smooth flow and decreased strain on the pipe line.

SUCKER ROD HOOK HAS NEW LOCKING DEVICE

The "Oilwell" Safety Sucker Rod Hook, manufactured by the Oil Well Supply Co., Pittsburgh, is of improved design and has an automatic locking mechanism. The locking feature is positive in action and cannot open until released by hand pressure on the latch mechanism in the handle and body of the hook, as shown in the accompanying illustration. The safety latch is raised up into the body when engaging or disengaging the hook, thereby eliminating possibility of its catching on the elevator bail, a frequent occurrence with swinging latches.

The handle, placed on the back of the hook, provides the operator with a gripping device for handling and operating the hook, and at the same time protects his hand from injury.

There are no projecting points on this hook to catch on any part of the derrick, and it is provided with a ball bearing bail. It is perfectly balanced and has few parts. The weight is 27 pounds, and the load capacity 10,000 pounds.

TRADE LITERATURE RECEIVED

The Superior Gas Engine Co., Springfield, Ohio, has issued a new bulletin describing the Superior-Otto Four-Cycle Airless Injection Diesel engine.

"Smooth Finish Machining of Low-Carbon Plain and Alloy Steels," by J. S. Vanick and T. H. Wickenden, has been reprinted from the "Transactions of the American Society for Steel Treating" and distributed by the International Nickel Co., New York.

A folder from S. F. Bowser & Co., Inc., Fort Wayne, Ind., enumerates the advantages of the Bowser storage systems for oils and gasoline tanks, pumps, lubricators and filters.

"Softened Water the Universal Need" is the subject of a bulletin distributed by Paige & Jones Chemical Co., Inc., Hammond, Ind., manufacturer of devices for softening water and of pressure sand filters.

The Bessemer Gas Engine Co. has completed an illustrated descriptive catalog of the Bessemer Type 10 compressors, giving a detailed technical description of the Type 10 compressor, covering engineering features and construction details, with color cuts.

The Duriron Co., Inc., of Dayton, Ohio, is sending to the oil refining industry a bulletin dealing with specific applications of Duriron and Alcumite acid-proof materials. The information given is of interest to operators of treating and acid-recovery plants.

The Pyrene Manufacturing Co. of Newark, N. J., distributes a folder dealing with the Phomene Accumulator, described as "an engineering development of revolutionary importance in the field of fire protection for flammable liquids."

CLIMAX ENGINEERING CO. ELECTS MALLORY

G. W. Dulany, Jr., chairman of the board of the Dulany Trust, Chicago, has announced the election of E. B. Mallory as vice president and director of the Climax Engineering Co., a subsidiary of the Dulany Trust.

Mr. Mallory began his career with the Westinghouse companies in 1903, and was trained in its various engineering, manufacturing and sales activities. He

E. B. Mallory

was manager of the radio department of the company during the phenomenal growth of that new branch of the electric industry, and brings to the engine industry a broad acquaintance among manufacturing and commercial interests, and an understanding of the problems of design, manufacture and exploitation of industrial apparatus.

The announcement further states that Mr. Mallory was elected president and member of the board of the Climax Electrical Refrigeration Co., manufacturer of refrigeration units for domestic, soda fountain, delicatessen, florist and other commercial applications.

CONTROL OF NEWTON COMPANY PURCHASED

Control of the Newton Process Manufacturing Co. of Fullerton, Calif., has been bought by the Southwestern Engineering Corp. of Los Angeles. The new board of directors consists of A. B. Menefee, H. Schwartz, Julius Kobernik, Frank W. Newton, G. W. Burnett and B. M. Snyder. Management will be practically the same as that of the Southwestern Engineering Corp., and it is planned to continue the manufacture of Newton equipment in virtually the same form as heretofore.

The Newton Process Manufacturing Co. has specialized in the manufacture of absorption plant equipment since the formation of the company in 1922. Its principal products are absorption towers, fractionating towers, stills, heat exchangers, condensers, gas coolers and accessory equipment for absorption plant use.

The change in control will effect a decided reduction in operating costs and overhead. The Southwestern Engineering Corp. now has offices in New York as well as Tulsa, Okla., and has recently established a branch at Montreal, Quebec.

The reputation of the Moore Tubular Steel Derrick is built on its strength, its long life, its ease of erection and convenience in handling. For twenty years it has gained the steadily increasing confidence of oil men because its design, together with the proper selection of materials for its fabrication, result in a structure which can be depended upon under all circumstances.

World Wide Service
for Twenty Years

LEE C. MOORE & CO., *Inc.* PITTSBURGH · TULSA

Established 1907

DALLAS, TEXAS HOUSTON, TEXAS WICHITA FALLS, TEXAS BORGER, TEXAS PARKERSBURG, W. VA.
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Announcement

Of Particular Interest to ENGINEERS

A NEW COMPANY—new in name only—has been formed and is now building heat transfer equipment of every type and size. . . . The company will be known as

HEAT TRANSFER PRODUCTS, Inc.
A Division of the
STATEN ISLAND SHIPBUILDING CO.
with the following officers:

WILLIAM J. DAVIDSON, *Chairman* GEORGE T. JACOCKS, *President* GEORGE H. BATES, *Treasurer*
SYLVAN J. CROOKER, *Vice-President* WALTER S. OGILVY, *Vice-President & Sec.*

The officers and personnel are men widely known for their engineering ability and achievements in design and construction.

With unlimited resources and manufacturing facilities to produce apparatus of any size, this company is ready to place at your disposal the largest and most complete engineering and production facilities in the industry and to cooperate with you on the design of the following equipment:

Heat Exchangers	**Condensers**	**Boilers**
Feed Water Heaters	**Evaporators**	**Tanks**
Bleeder Heaters	**Oil Heaters**	**Piping**
Storage Heaters	**Humidifiers**	**Pumps**
Superheaters	**De-Humidifiers**	**Coils and Bends**
Service Water Heaters	**Waste Heat Extractors**	**Fabricated Plate Work**

and special equipment for the following applications:

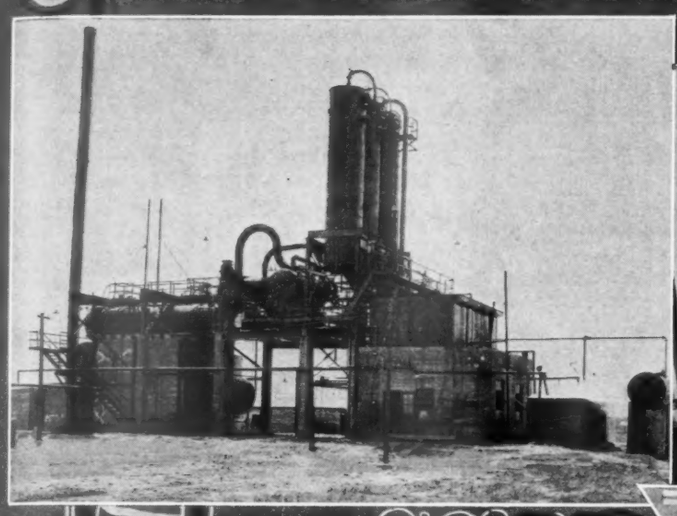
Power Plants	**Gas Plants**	**Refrigeration**
Oil Refining	**Air Conditioning**	**Textile Mills**
Chemical Plants	**Heating and Ventilating**	**Laundries, etc.**

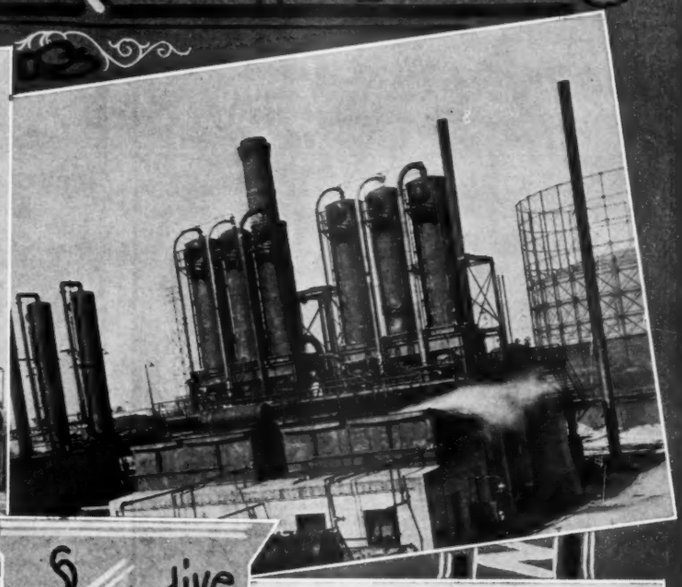
We will consider it a privilege to send you in detail any information you desire on your particular heat transfer problems

HEAT TRANSFER PRODUCTS, Inc.

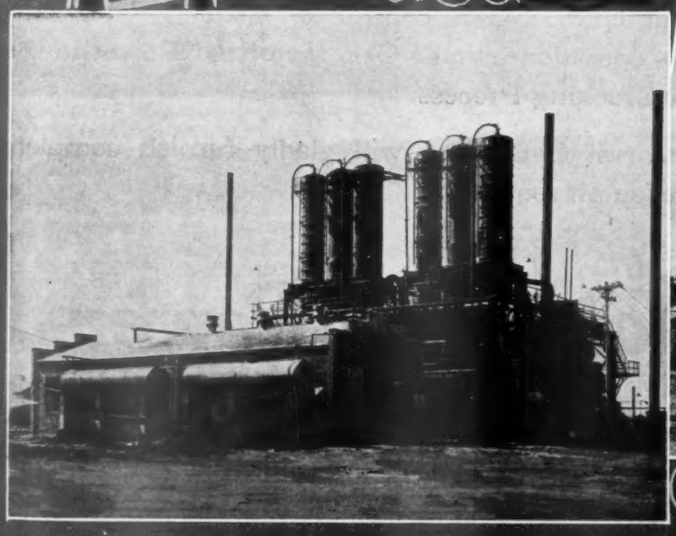
A Division of the
STATEN ISLAND SHIPBUILDING CO.
90 West Street, New York

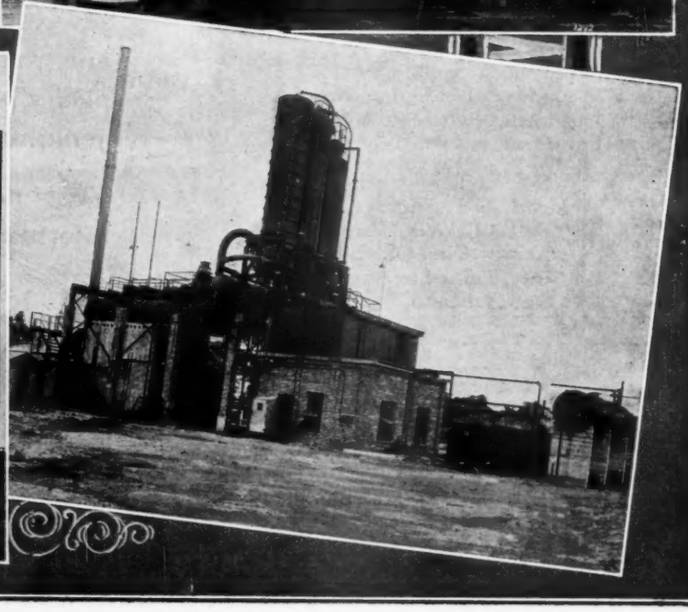
JENKINS CRACKING PROCESS

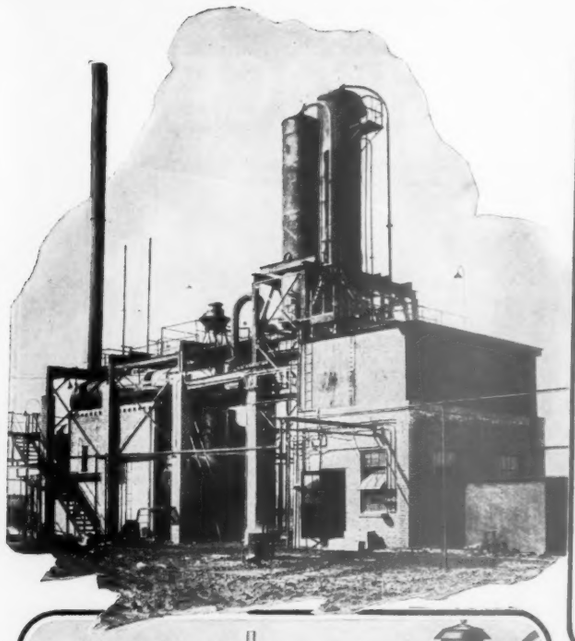


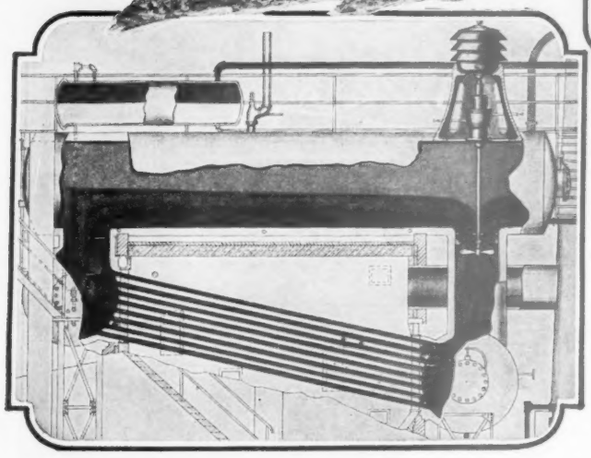


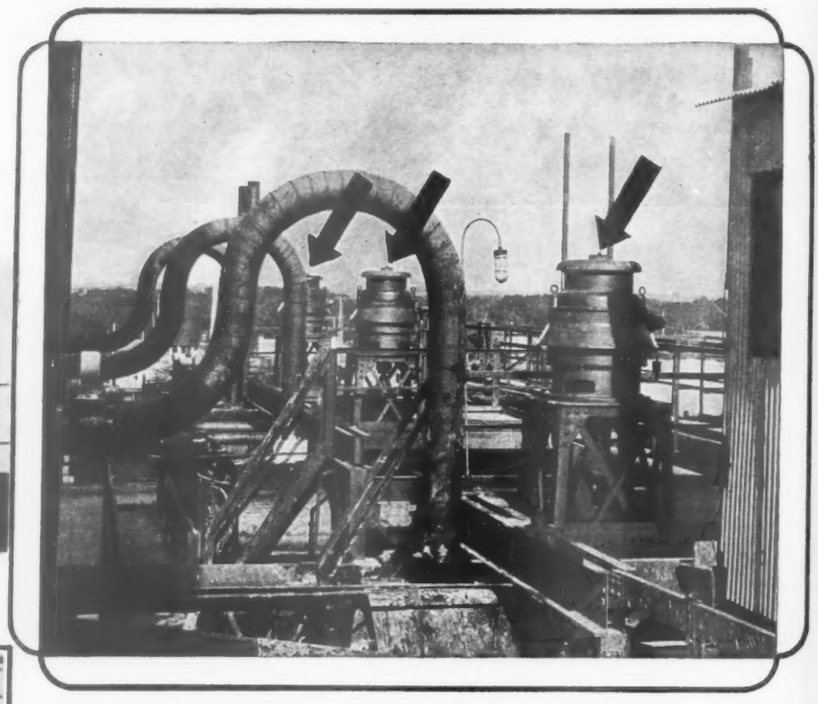
Representative Installations











G-E Motorized Power in the Jenkins Cracking Process

The vital function of the G-E motor in the Jenkins Cracking Process is plainly shown by the accompanying diagram. In this application motor failure *must not* occur. For constant, never-failing circulation of cracking stock through the tubes, you can rely on G-E equipment.

Weatherproof construction for continuous operation in severest weather; careful design for economy in power and maintenance; G-E control for flexibility and simplicity of operation—that's G-E Motorized Power in the Jenkins Cracking Process.

Your nearest G-E office will gladly furnish complete information on request.

General Electric supplies complete electric equipment to the oil industry. With warehouse facilities close to your operations, G.E. readily furnishes motors, controllers, transformers, arresters and other protective devices, capacitors for power-factor improvement, switching equipment, etc.

G-E oil field specialists and G-E service at: Dallas, Denver, Houston, Kansas City, Oklahoma City, Tulsa, Los Angeles, San Francisco.

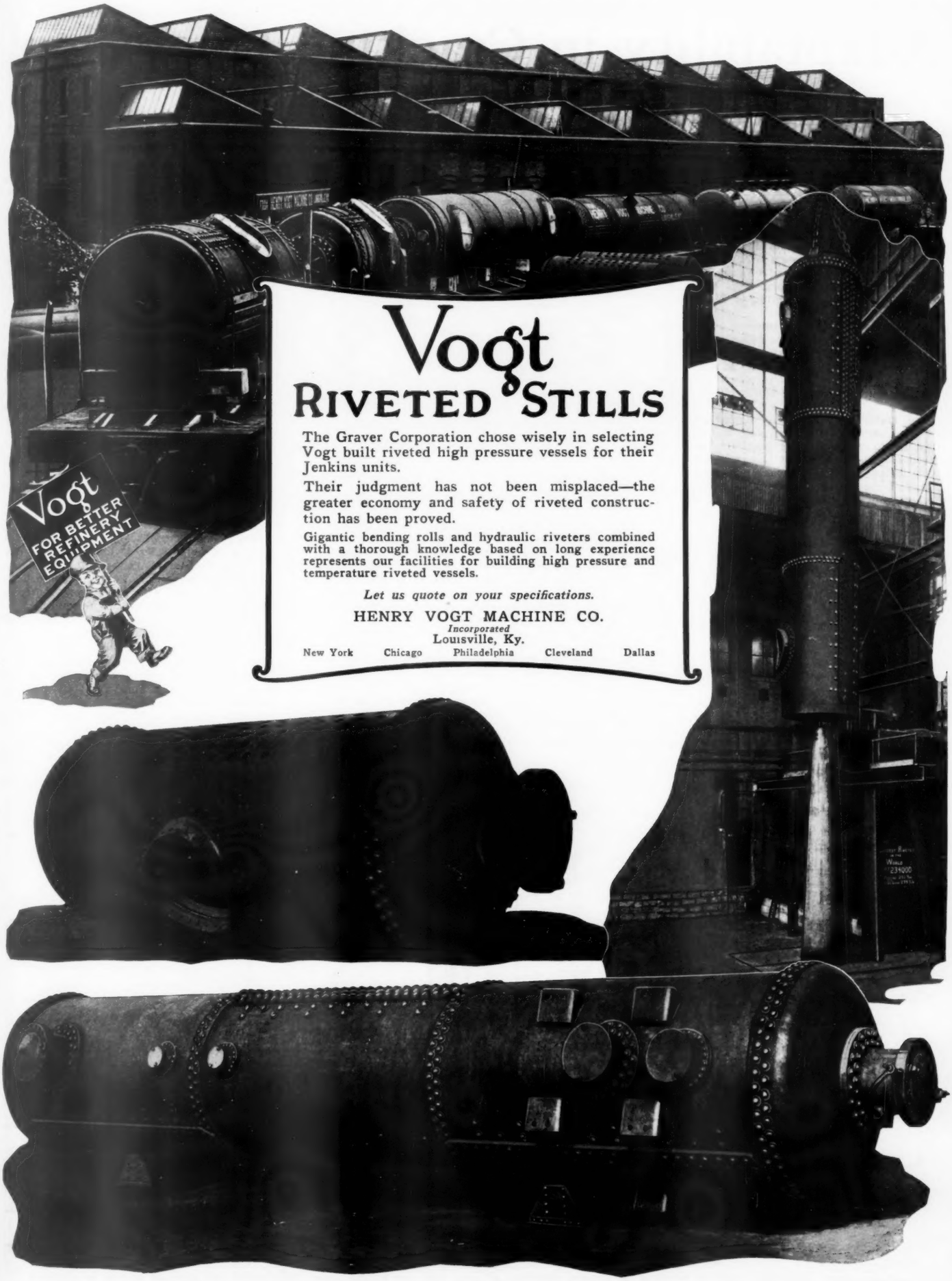
Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power.

Motorized Power
—fitted to every need

200-101

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N.Y., SALES OFFICES IN PRINCIPAL CITIES



Vogt
RIVETED STILLS

The Graver Corporation chose wisely in selecting Vogt built riveted high pressure vessels for their Jenkins units.

Their judgment has not been misplaced—the greater economy and safety of riveted construction has been proved.

Gigantic bending rolls and hydraulic riveters combined with a thorough knowledge based on long experience represents our facilities for building high pressure and temperature riveted vessels.

Let us quote on your specifications.

HENRY VOGT MACHINE CO.
Incorporated
Louisville, Ky.

New York Chicago Philadelphia Cleveland Dallas

Adaptability in Cracking Operation

Jenkins Installations Operate With Several Grades of Charging Stock. Fit in With General Scheme of Refining

By C. O. Willson

This is the story of a cracking process which has been made adaptable to refinery requirements.

The process commonly known among the refining fraternity as the "Jenkins" had its first commercial installation about four years ago and now has units in operation in most of the important refining centers. Those responsible for its development have endeavored to perfect a process which would meet the cracking requirements of a refinery regardless of the conditions existing in regard to the supply of raw material or the marketing of the finished products.

As evidence of the accomplishment of this aim Jenkins cracking units are now being operated by refiners with crude oil, topped crude, gas oil and fuel oil residuum as charging stock. In some cases two or more of these raw products have been blended together to secure the raw material for the cracking operation.

In the marketing end these varying charging stocks have been manufactured into a variety of finished products meeting the particular sales requirements of the licensees of the process. These products include all grades of gasoline meeting export and domestic specifications, kerosene, distillates, gas oil and commercial grades of fuel oil, the latter being the residuum product of the operation.

Aim of Designers

In brief the aim of the designers of the Jenkins process has been to perfect a process which would fit into the plant operator's existing scheme of refining rather than building a cracking plant of arbitrary specifications to which the owner would have to adjust all phases of his refinery operation. Before installing one or more units at a refinery, the engineers of the Jenkins Petroleum Process Company, owners of the process, and the Graver Corporation, sales representatives and builders of the process first determine the conditions under which the refinery is operated. This information is considered along with the data covering the products for which there are the most profitable outlets and the cracking unit is then designed to give the maximum returns. As just explained this design includes a wide flexibility as to charging stock for the cracking equipment.

JENKINS INSTALLATIONS

	No. of Units
Skelly Oil Co., Eldorado, Kans.	12
Kanotex Ref. Co., Arkansas City, Kans.	3
Peerless Oil & Refining Co., Chanute, Kans.	2
Crystal Oil Refining Co., Shreveport, La.	2
Terminal Oil & Refining Co., Houston, Tex.	1
Bartles Maguire Oil Co., East Chicago, Ind.	2
White Eagle Oil & Ref. Co., Casper, Wyo.	1
Golden Rule Refining Co., Wichita, Kans.	1
Ogura Oil Co., Tokyo, Japan	1
Garber Refining, Garber, Okla.	1
Shreveport P. & R. Co., Shreveport, La.	1
Wilhoit Refining Co., Joplin, Mo.	1
Bolene Refining Co., Enid, Okla.	2
Independent Oil & Gas Co., Okmulgee, Okla.	1
McColl Bros., Ltd., Toronto, Canada	1
Petrol Gas Co., Los Angeles, Calif.	1

This article is not concerned with the engineering details of construction although it is granted that they have played an all important part in the successful operation of the Jenkins process. Supplementing the work of those who were responsible for the patented features, a number of manufacturers of special equipment have made a study of the particular needs of the Jenkins process and their contributions have added largely to the practical phases of its development.

However as has just been explained these details in construction vary with the different installations and the detailed data are available to those who desire to obtain them. Many of the equipment features are apparent from the accompanying photographs. This description will be confined to the general phases of operation covering the essential features common to all installations with a summarization of the actual results obtained.

Typical Installation

In connection with the description attention is first called to the accompanying flow chart No. 1. This chart shows the flow of liquid and vapor in a unit which is representative of one type of installation. The charging stock from storage in all Jenkins installations enters the unit through a reflux tower. In this tower the charge comes in contact with the vapors direct from the cracking still. This contact of liquid and vapor serves to preheat the former, vaporizing the light ends should there be any present, and at the same time knocks back all the heavy ends in the vapor.

The liquid charge as reflux from the base of this tower flows down to the cracking still. The still proper consists of a horizontal shell with a capacity of from 8,000 to 10,000 gallons. Underneath this shell and near both ends are sluiceways or legs connecting to cross drums. The front leg is shorter than the rear leg so that the numerous tubes which connect the two cross drums slant down from the front to the rear. The 120 or more tubes are exposed to the heat of the furnace.

Circulation of Oil

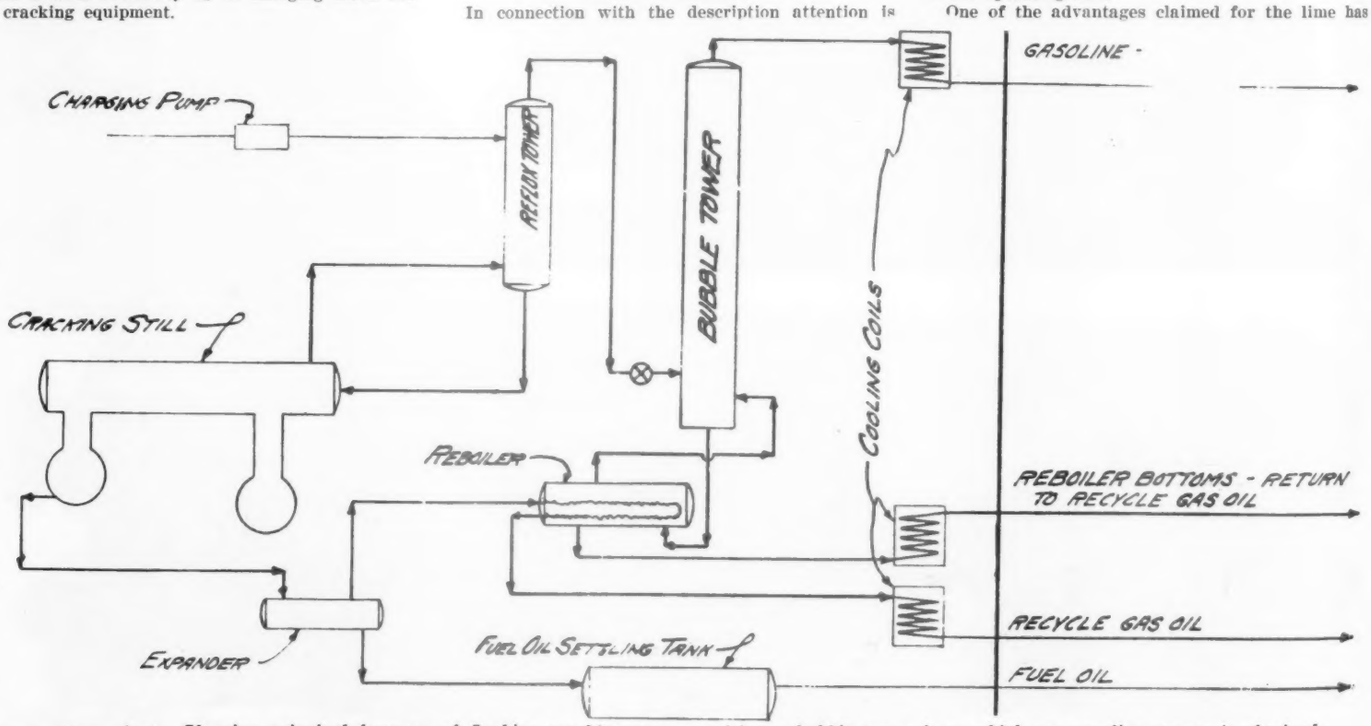
Near the upper part of the rear leg is a propeller which determines the rate of oil circulation in the still. This propeller is driven at a constant speed by a 35 horsepower electric motor located on top of the still.

This arrangement for oil circulation in the still is one of the unique and basic features of the Jenkins process. The propeller device assures the complete circulation of the oil in the still approximately once every 20 seconds. This rapid circulation of the charging stock with the vapors constantly passing off to the fractionating towers tends to prevent "over cracking" and reduces the amount of carbon deposited in the still.

Use of Lime

In this connection another important feature of the Jenkins process should be pointed out. As the charging stock is being pumped to the cracking unit a small amount of hydrated lime is fed into the line. The amount of lime used varies with the charging stocks but generally does not exceed 50 pounds of lime per 100 barrels of charging stock. Lime is inexpensive so that its use adds very little to the operating cost.

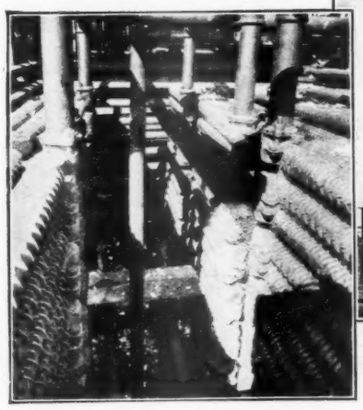
One of the advantages claimed for the lime has

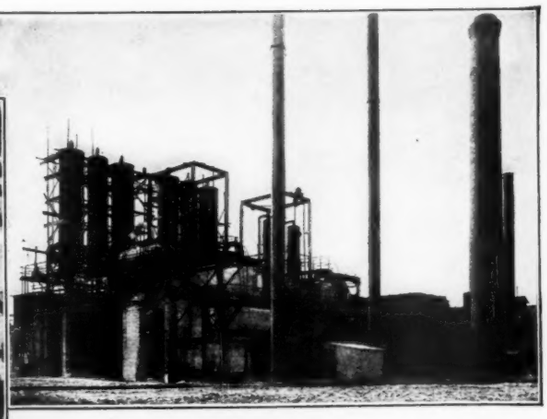


No. 1—Flow chart. Showing principal features of Jenkins cracking process with one bubble tower from which one gasoline stream is obtained.

STERLING

Twin Unit of Jenkins Still





STERLING Oil Refining Sections used in Jenkins Cracking Process Installations

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RESIST CORROSION—SAVE SPACE
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7 Skelly Oil Co., Eldorado, Kans.
1 Shreveport Producing & Refining Corp., Shreveport, La.
2 Peerless Oil & Refining Co., Chanute, Kans.
2 Kanotex Refining Co., Arkansas City, Kans.
2 Bolene Refining Co., Enid, Okla.
1 Independent Oil & Gas Co., Okmulgee, Okla.
1 Terminal Oil & Refining Co., Houston, Texas.
1 White Eagle Oil & Refining Co., Casper, Wyoming
1 Golden Rule Refining Co., Wichita, Kans.
1 Garber Refinery Co., Garber, Okla.
2 Bartles-Macguire Oil Co., East Chicago, Ind.

For these reasons the Graver Corp. have installed STERLING OIL SECTIONS and accessories in the 22 Jenkins Process Units, erected at the refineries listed to the left.

STERLING OIL SECTIONS were adopted for this service for the very obvious reasons, that they increase the life of the condensers by successfully resisting corrosion; afford materially increased efficiency; are of exceptionally low maintenance cost; and are immediately accessible. Besides they save from 20% to 50% space.

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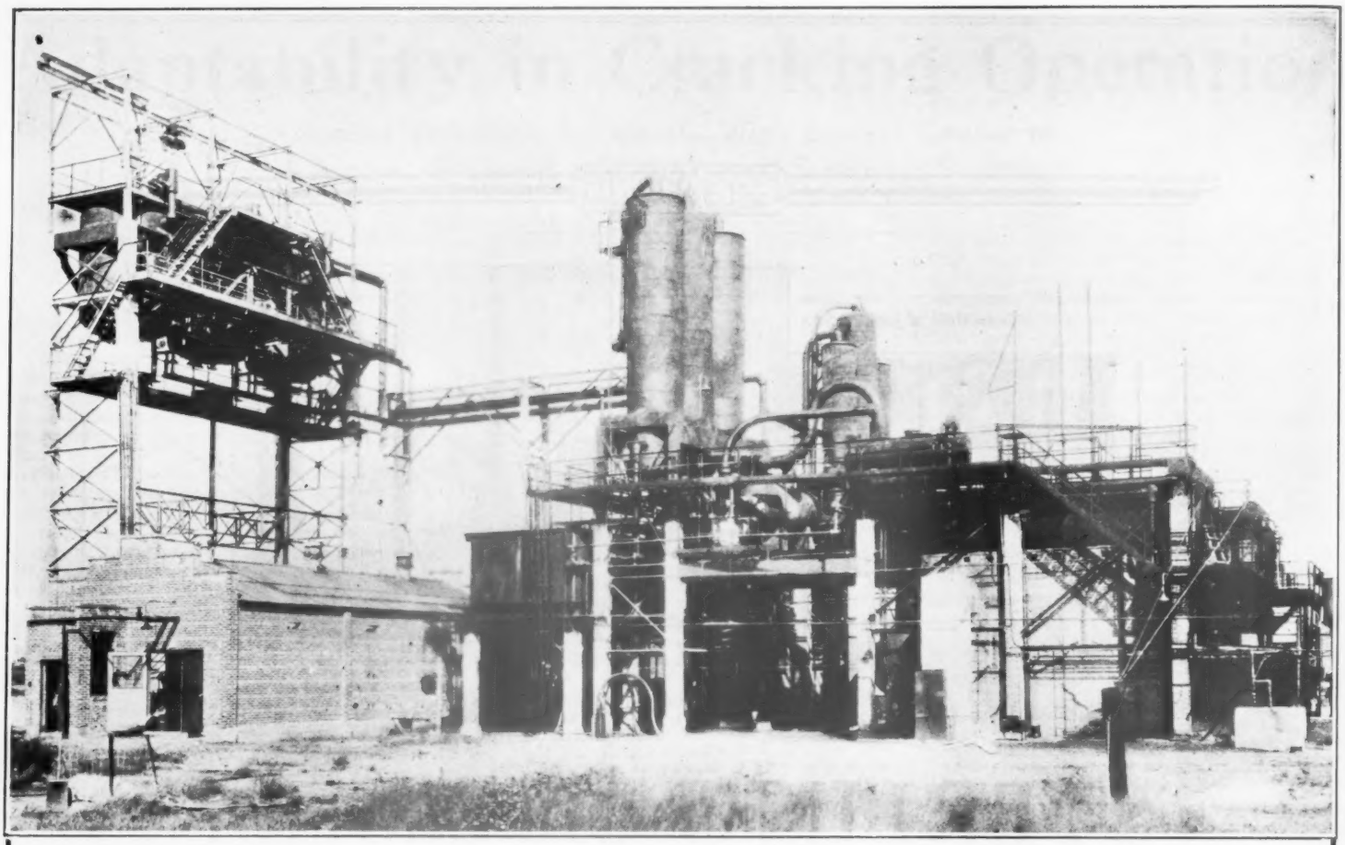

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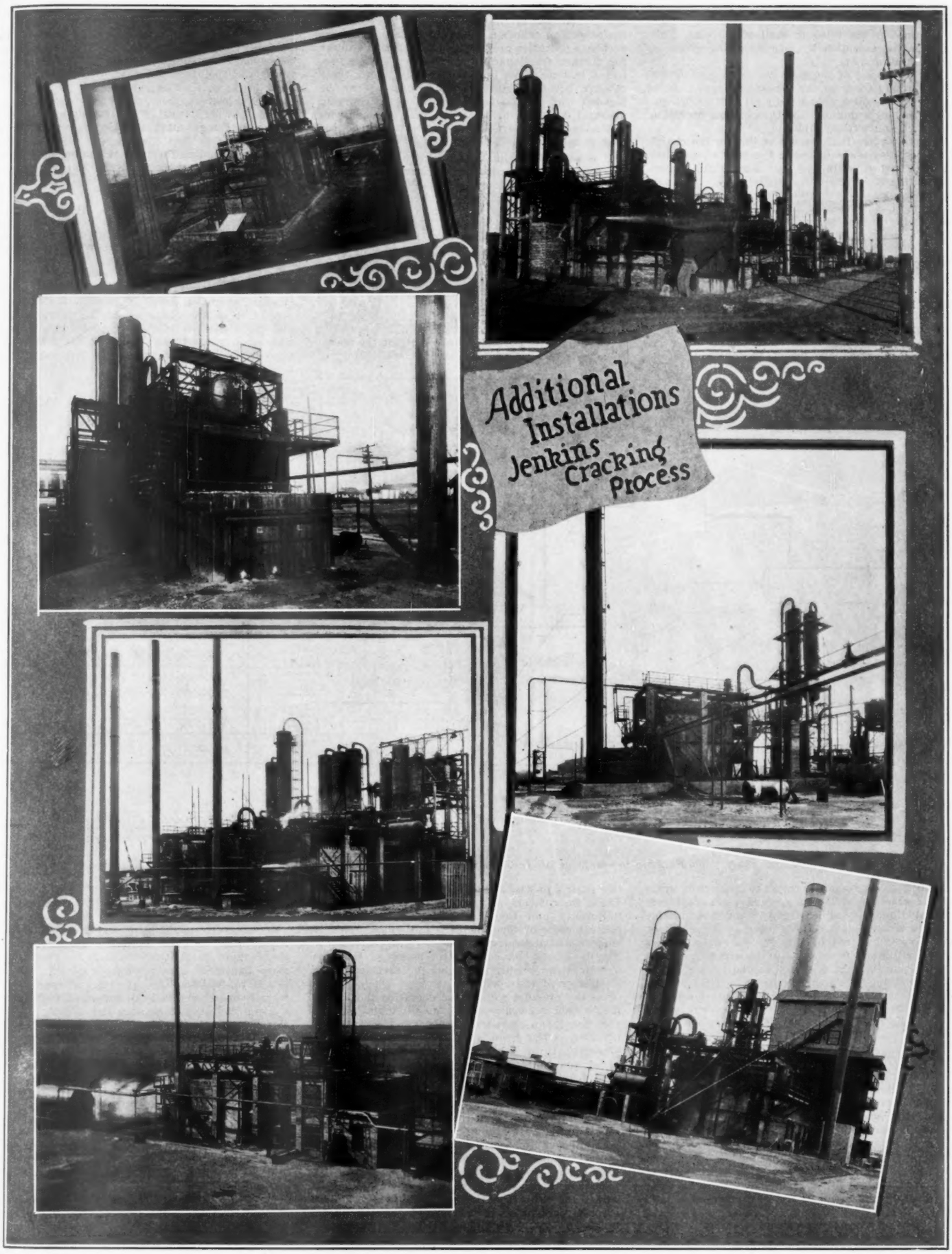

Additional
Installations
Jenkins
Cracking
Process

to do with the carbon formation in the cracking operation. Coupled with the rapid circulation of the oil it reduces to a minimum the amount of carbon formed in the tubes or shell of the still. This explains the exceptionally long operating cycles of the Jenkins process.

Due to the use of the lime the small quantity of carbon produced from the Jenkins operation is in an amorphous form. Practically all of it settles out of the fuel oil residuum from the cracking operation in the fuel oil settling tank.

Chemists agree that the use of lime in the charging stock also tends to lessen the treating problem for the finished products. This is especially important with certain types of charging stock. Through polymerization some of the compounds responsible for gum in gasoline are removed. The lime also adds to the life of the equipment as it reduces corrosive action in the still and towers. This is due to the chemical combination of sulphur and lime to form calcium sulphide. This removes the hydrogen sulphide which is corrosive to iron at high cracking temperatures. The general practice in the use of the lime is to secure first a thorough mixture of the chemical with oil and then inject the combination into the charging line.

Recycle Oil

A predetermined amount of the charging stock is drawn off continuously from the front cross drum of the cracking still. This liquid contains a considerable quantity of light ends which are suitable for use as recycle stock in the cracking stock or may be sold by the refiner as gas oil. These lighter ends are allowed to vaporize in the expansion chamber passing to what is known as the reboiler. The remaining liquid which contains a small quantity of coke in the amorphous form as previously explained first goes to a fuel oil settling tank where the carbon settles out. The liquid residuum in all cases is fuel oil of very high grade specifications including a low cold test.

Fractionating Division

Returning now to the flow of vapors as shown in Chart 1, the fractionating division of the Jenkins operation is easily explained. The cracked vapors minus the heavy ends which have been absorbed by the incoming charge in the reflux tower pass to a large bubble tower. By means of a reducing valve between the reflux and bubble towers the pressure of the cracking operation is reduced as low as is desired for efficient fractionation. The bubble tower operation is just as flexible as it is in skimming plant operations.

Gasoline Stream

In the operation on which the No. 1 Flow Chart is based one gasoline stream is taken from the tower. Near the base of the tower the reflux is removed and dropped back into the shell of the reboiler. Here the light ends of the reflux are again vaporized by the hot vapors in the coil from the expansion chamber. The vapors from this heat exchange operation are returned to the bubble tower for further fractionation. The heavy ends as reboiler bottoms pass to cooling coils. Both these reboiler bottoms and the recycle gas oil can be blended with fresh stock and utilized as charging material for the cracking operation. In many installations, this recycle gas oil constitutes 50 per cent or more of the original charge.

It is pointed out in this connection that this gas oil product secured from the expansion chamber and the reboiler is more adaptable for further cracking than many gas oil cuts secured in a cracking operation. This is due to the fact that the gas oil is not a residuum product obtained after the cracking operation is completed but is removed continually from the cracking still in a flushing operation. Tests made by operators in which only recycle stock was used as charging stock have verified this contention as to the desirability of the recycle gas oil for further cracking.

Method of Control

In most of the installations, control of the operations is centralized in the pump house. Most of the control instruments are located at this point. These instruments play an important part in the uniformity and the ease of operation which is characteristic of the Jenkins installations. The recorders and indicators of the several controls are usually located on one control board so that the operators can readily determine the exact status of all phases of the operation.

On the pressure side of the operation the instruments used generally include a still indicator, still recorder, pump pressure of charging stock and the pressure of the steam from the power plant. The pressure at the release valve between the reflux tower and the bubble towers is also shown.

In regulating the flow of liquid and vapors the control is largely automatic. A governor maintains a constant pressure at the charging pump. Through a temperature control at the top of the reflux tower the required regulation of the outgoing vapors is maintained automatically. Thus by regulating the control temperature of the reflux tower the overhead vapors passing to the bubble tower are of uniform specification. A final control of the vapors which constitute the finished gasoline is obtained through the knockout controls at the top of the bubble towers. Gas oil is circulated through the coils in the top of the towers by pumps. Through automatic controls a uniform temperature is maintained in the coils which in turn determines the specifications of the vapors passing to the condensers.

Other Features

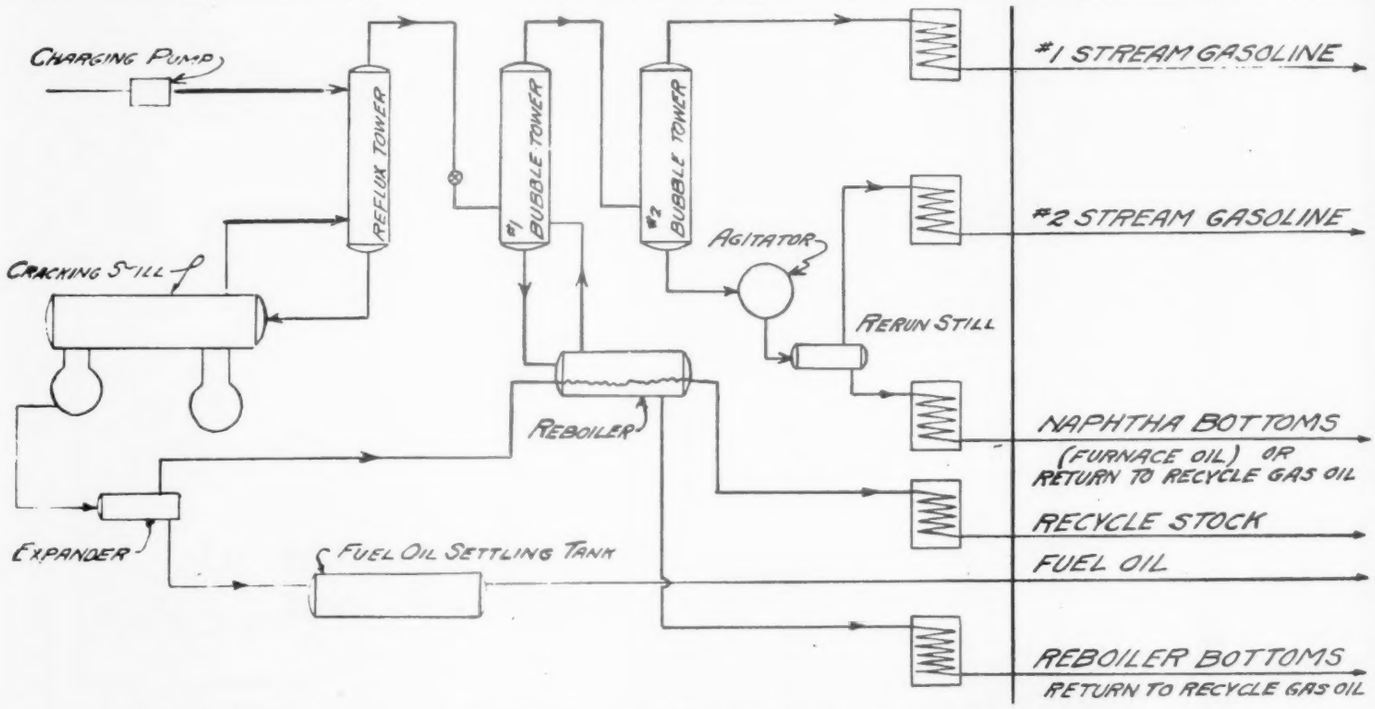
In the operation, furnace control is also automatically maintained by means of a thermocouple connected to a control pyrometer. This control varies the fuel feed based on changes in temperature in the combustion chamber.

As is apparent from the accompanying photographs showing several of the installations all parts of the cracking unit are easily accessible to the operators. This fact coupled with the method of operation including the type of equipment used accounts for the fact that the Jenkins installations have an enviable record from the standpoint of safety.

In practically all installations, provision is made for the recirculation of a part of the flue gases and the preheating of the air used in combustion. This is a phase of operation which has contributed materially to the low fuel cost.

Operating Pressures

The operating pressures used in the Jenkins cracking operation vary. This variation is largely dependent on the character of the charging stock and the yields of finished products which the refiner desires to obtain. Some of the newer units have an operating pressure up to 200 pounds. All of the units, however, are now operating under 175 pounds and in most cases a pressure around 135 pounds gives the desired results.



No. 2—Flow chart. Two-bubble-tower type of Jenkins installation from which two gasoline streams are obtained.

It has been pointed out in this connection by technologists familiar with the operation that in the Jenkins installations uniform temperatures are more important than pressure control. The practice is to determine by experimental operation just what temperatures and pressures are desirable with a given charging stock and then adjust the operation on that basis. One of the largest users of Jenkins equipment charges the bulk of the raw gas oil charging stock to two units operated at relatively low pressures and temperature. The recycle stock from these units is then charged to a third unit which is operated at a higher temperature and pressure.

Two Gasoline Streams

In an operation such as is shown in the No. 1 Flow Chart no attempt is made to separate the overhead recovery of gasoline. With the one tower type of installation it is usually necessary to rerun the overhead cut when it contains the low naphtha ends. Just what operation is the most feasible will depend entirely on the type of charging stock and the products desired.

In most Jenkins installations it is customary to take both a high and low gravity gasoline stream

(Continued on Page J-16)

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uses
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HEAT INSULATION
for Greatest Efficiency

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Price plays no part in its selection—only efficiency and high quality are considered.

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There is no Substitute for Quality--
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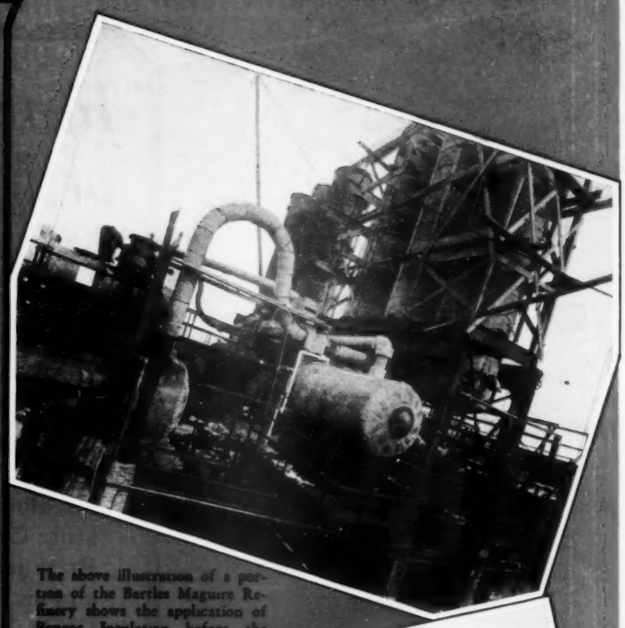
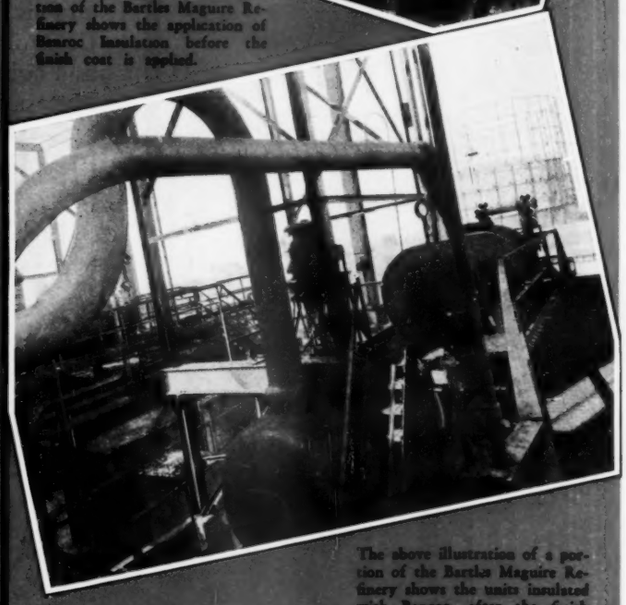


The above illustration of a portion of the Bartles Maguire Refinery shows the application of Banroc Insulation before the finish coat is applied.



The above illustration of a portion of the Bartles Maguire Refinery shows the units insulated with Banroc, after the finish coat is applied.

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Pressure and Temperature Control instruments in Pump House.
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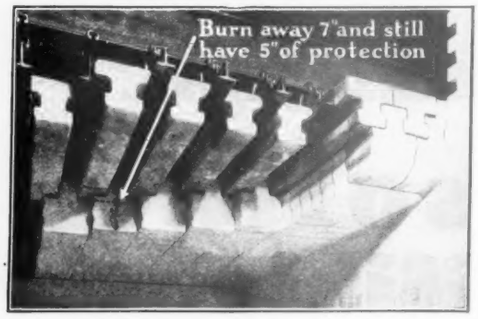

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Rapid Increase in Refinery Output of Cracked Gasoline

Gasoline obtained from the operation of cracking processes continues to grow as a major source of motor fuel in United States.

The government reports for the first nine months of 1927 show that the production of cracked gasoline totaled 74,042,000 bbls. This is an increase of 6,516,000 bbls. or about 10 per cent over the first nine months of 1926. It is also 8 per cent greater than the total production of cracked gasoline for all of 1925, the first year in which the government figures differentiated between the straightrun, cracked and natural gasolines.

The following table shows the production of cracked gasoline by months for the year 1926 and the latest available data for 1927. Production is given in thousands of barrels.

Month—	1927	1926
January	8,874	6,819
February	7,979	6,339
March	8,704	7,051
April	7,663	7,309
May	7,714	7,832
June	7,957	7,880
July	8,355	8,079
August	8,482	8,218
September	8,314	7,999
October	....	8,580
November	....	8,658
December	....	8,972

Cracking processes this year will furnish better than 30 per cent of the total gasoline produced by refiners in United States. In 1926 the percentage was 26.

30 Per Cent of Total

This increase in cracked gasoline has developed this year despite the fact that exceptionally low gasoline prices have been in effect with correspondingly low crude oil prices. These conditions are not favorable from the standpoint of cracking operations. Nevertheless as reflected in government figures most owners of cracking processes have found it profitable to operate them and quite a number of new installations were made during the year. With a return to normal price conditions a rapid expansion in cracking facilities is assured.

For the entire United States cracked gasoline this year will furnish a little better than 30 per cent of the entire supply of motor fuel as previously stated. However, in many refining areas this percentage will be much larger.

For instance according to the government report covering September operations, 44 per cent of the gasoline produced by Indiana and Illinois refiners was cracked gasoline. Refiners in that area have led in the development of cracking operations and secure a greater percentage than any other section.

In Texas the September output of cracked gasoline was 42 per cent of the total. In Oklahoma and Kansas the percentage was 30. A few years ago the cracking operations at the 75 operating refineries in those two states were confined to three plants. California's output of cracked gasoline is still very small being only 4 per cent of the total gasoline produced.

Texas Leads

In output of cracked gasoline, Texas leads all other refining areas. Its output in September totaled 2,474,000 bbls., or approximately 30 per cent of the total for the entire United States. The bulk of the cracked gasoline in Texas comes from the cracking installations of refineries located along the Gulf Coast. Practically all of the major plants in that area have cracking equipment which enables them to secure a large yield of gasoline from the several type crude oils with which they operate.

Next to Texas comes the East Coast refiners with a total output of 1,367,000 bbls. of cracked gasoline in September. This includes all the refineries located along the Atlantic seaboard.

The total production of cracked gasoline in September at Gulf Coast refineries, including Texas and Louisiana, was 2,731,000 bbls.

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CONSTANT PRESSURE OIL PUMP GOVERNOR
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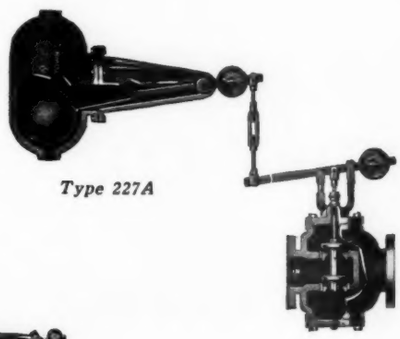
The Graver Corporation is using in connection with the Jenkins process Fisher "aids," represented by the types of controllers and governors shown here. The use of these types by the Graver Corporation is an endorsement in itself. All Fisher equipment is sold under an iron-clad guarantee to function properly in the capacity for which each type is designed.

Type 227-15



Type 227A

Type 240

Type 52

CONSTANT PRESSURE OIL PUMP GOVERNOR
Type No. 56
For Discharge Pressures, 5 to 150 lbs.

An all bronze governor, diaphragm actuated and spring controlled, particularly adapted to small pumping units for discharge pressure up to 150 lbs. Especially recommended for pumps handling oils or similar fluids, where a metal diaphragm is desired. It will positively control the discharge pressure of a pump delivering oil or other liquids under pressure to burners, orifice plates, nozzles, etc.

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LIQUID LEVEL CONTROLLER
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A liquid level controller or regulator for holding a predetermined level of liquid in such apparatus as stills, absorber towers, receivers, pipe lines, heaters, condensers, closed tanks, etc., where an external float is preferred. It is applied to all equipment where baffle plates, condenser tubing, internal piping, and other obstructions prevent the placing of a float inside the vessel holding the liquid.

Type 55

THE FISHER GOVERNOR COMPANY
402 FISHER BUILDING
MARSHALLTOWN, IOWA, U. S. A.

ADAPTABILITY IN CRACKING OPERATIONS

(Continued from Page J-8)

from the cracking unit, the former in many cases being 75 per cent of the total recovery of motor fuel. It is only necessary to doctor treat—where such a test is required—this high gravity stream to secure a finished gasoline.

As representative of this type of installation attention is called to No. 2 Flow Chart. It will be noted that in this installation there are two bubble towers. The reboiler operates in connection with the first bubble tower in exactly the same manner that it did with the one bubble tower in the installation shown in the No. 1 Flow Chart.

In the second bubble tower the high gravity stream is taken overhead with the reflux going to a rerun still. In the rerun operation a large yield of gasoline is obtained. This gasoline, like the high gravity stream only, has to be given a slight sweetening treatment to be suitable for the market. The naphtha bottoms from the rerun still are suitable for use as furnace oil distillate or may be used as recycle stock. The gasoline streams can be mar-

TABLE 1—PLANT "A"
Seminole Crude and 24-26 A.P.I. Mid-Continent Fuel Oil. Cracking

Fractions:	Total Barrels	Per Cent Throughput	Per Cent Ultimate Yield From 18,597 Barrels	Average Barrels Per Day
Charge	42,515	100.00	....	1,667
Straight gasoline	12,193	28.68	65.56	478
Recycle stock	23,917	56.26	....	938
Fuel oil	5,862	13.79	31.52	230
Loss	543	1.27	2.92	21
Total crude oil used				11,987.80
Total fuel oil used				6,021.90
Total fresh gas oil used				588.06
Total oil consumed				18,597.76
Total gasoline from crude				4,554.56
Total gasoline from cracking				7,639.03
Gasoline produced				12,193.59

	Light Gasoline	Naphtha	Reboiler Bottoms	Recycle Stock	Residuum	Charging Stock
Gravity	59.9	44.3	34.1	27.4	12.2	30.9
I.B.P.	128	216	424	410	497	170
10%	157	327	448	465	605	358
20%	188	352	460	490	656	451
30%	215	373	467	503	684	494
40%	240	387	473	517	698	518
50%	266	400	480	533	702	544
60%	294	410	488	556	C.	585
70%	326	419	497	588	...	635
80%	360	429	510	628	...	707
90%	398	439	536	693	...	734
95%	...	...	98%	...	...	744
Max.	424	458	610	740	...	C.*
Rec'y	97%	98.5%	C.*	99.0%	...	...

TABLE 1—PLANT A (Continued)

	Gum	Sulphur	Carbon Residue	Viscosity Furol 122	Unsaturates	Cold Test
Light gaso.	1.0	.094	....	....	9.0%	....
Naphtha	4.0	.104	....	....	6.0%	....
Treated gaso.	6.4	.079	....	....	12.0%	....
Reboiler btms.	...	.173	.020	....	4.0%	B.Z.*
Recycle stock.	...	.338	.101	....	12.0%	B.Z.
Residumm	...	.595	....	64.1 sec.	.....	45
Charging stk.	...	.203	.745	....	17.0%	B.Z.

Note—C*, cracking. B.Z.*, below 0 degrees Fahrenheit.

TABLE 2—PLANT "B"
Gulf Coastal Crude Oil Cracking 252 Hours on Stream

Fractions:	Total Barrels	Per Cent Throughput	Per Cent Ultimate Yield From 6,906 Barrels	Average Total Bbls. Per Day
Charge	14,482	100.00	....	1,379
Straight gasoline	4,069	28.10	58.92	387
Recycle stock	7,577	52.32	....	722
Beboiler bottoms	356	2.46	5.15	34
Fuel oil	2,306	15.92	33.43	220
Loss	173	1.20	2.50	16
Total crude oil used				3,704.16
Total gas oil used				3,200.90
Fresh stock consumed				6,905.06
Straight gasoline from crude				1,017.64
Straight gasoline from cracking				3,051.16
Total gasoline				4,068.80

TABLE 2—PLANT B (Continued)

	Light Gasoline	Reboiler Bottoms	Recycle Stock	Residuum	Charging Stock	Panhandle Crude Fresh Stock
Gravity	56.3	32.1	23.5	14.7	28.0	36.7
I.B.P.	115	400	330	410	164	146
10%	180	427	457	494	359	230
20%	214	434	480	542	456	312
30%	241	440	495	583	490	410
40%	265	445	507	638	517	510
50%	290	450	528	684	546	598
60%	312	456	552	710	584	660
70%	332	464	586	732	636	690
80%	343	475	627	...	687	708
90%	377	496	696	736	702	86
95%	...	...	...	C.	C.	712
Max.	400	566	751	...	...	C.
Rec'vy.	97%	98%	96%	...	...	...

	Gum	Sulphur	Carbon Residue	Viscosity Furol 122	Unsaturates	Cold Test	n.s.
Light gaso.	.08	.198	....	....	10.2%	....	..
Reboiler bottoms	....	.191	.027	....	6.0%	B.Z.	..
Recycle stk.	...	.327	.075	....	20.0%	25	..
Residuum	...	.449	....	15.5 sec.	.....	B.Z.	†
Charging stock	...	.473	.728	....	.....	15	..
Panhandle crude	...	.675	....	....	.....	55	..

†Trace.

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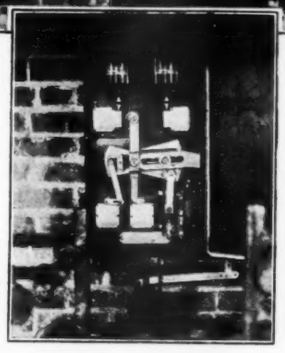
for Maximum Yield

An L & N installation used in connection with Jenkins Cracking Stills. Vapor temperatures of bubble towers automatically controlled with two L & N Potentiometer Proportional Step Controllers. A two point L & N Potentiometer Recorder checks controller performance. Chart in circle shows extreme accuracy of control. Controller and valve shown at right.



ESPECIALLY in oil refining, allowable limits of temperature are very close. Temperature pulsations in the coil outlet and vapor lines greatly reduce the yield.

Because of this, L & N Potentiometer Pyrometers are essential in all cracking processes, whatever the type of still. Steadiness of operation is made possible by the accuracy of the L & N Potentiometer Temperature Controller.

The Plant Engineer finds many uses for L & N Potentiometers. He uses them for recording and automatically controlling temperatures in his combustion chambers, in his continuous stills, his vacuum stills, his cracking stills, his coil outlet pipes. He also measures storage tank temperatures with these instruments.

L & N Potentiometer Pyrometers are different. They are extremely accurate and reliable, easy to read, unaffected by temperatures at all points except that being measured, and length of leads has no effect upon accuracy of reading.

Write for Bulletin 870-O

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Potentiometer

most accurate • • PYROMETER • • in industry

keted separately or blended to secure a motor fuel of the specifications desired.

Still another type of installation is shown in No. 3 Flow Chart. This operation differs from that shown in No. 2 Flow Chart in that the high gravity gasoline stream is taken overhead from the No. 1 rather than the No. 2 bubble tower. The reflux from both towers drops back into the reboiler and the vapors from the reboiler are returned to the No. 2 bubble tower.

Treating in Vapor Phase

With this type of installation towers for treating in vapor phase have been utilized. Most operators are familiar with this equipment as it has been installed at several refineries in connection with both cracking and skimming operations. It has given satisfactory results where it has been installed with the Jenkins cracking units.

The operation consists in passing the gasoline vapors to the towers which contain fuller's earth. The contact of the clay and the vapors result in a gasoline which requires very little if any additional treatment. The method of treatment is especially desirable in a cracking operation as the treatment with the clay in the vapor phase enables the operator to retain in his gasoline the aromatic hydrocarbons which add to the antiknock value of a motor fuel.

In the type of installation shown in No. 3 Flow

TABLE 3—PLANT "C"
California Gas Oil Cracking 157 Hours on Stream

Fractions:	Total Barrels	Per Cent Throughput	Per Cent Ultimate Yield	Average Total Bbls. Per Day
Charge	8,175	100.00	3,680.4 bbls.	1,250
Gasoline	2,287	27.98	62.7%	350
Recycle	4,494	54.97	.....	676
Fuel oil	951	11.63	25.5	65.2
Loss	443	5.42	11.8	158.8

	Gasoline	Recycle Stock	Residue	Charging Stock
Gravity	58.7	23.0	14 Be.	28.8
I.B.P.	90	360	.....	300
10%	172	466	.....	430
20%	202	496	.....	490
30%	243	520	.....	515
40%	258	560	.....	540
50%	275	570	.....	570
60%	301	590	.....	592
70%	318	610	.....	620
80%	336	640	.....	655
90%	376	690	.....	710
Max.	406	745	.....	755

Still temperature, 770 degrees Fahrenheit; furnace temperature, 1,475 degrees Fahrenheit; pressure, 135 pounds; fuel used, only still gases.

TABLE 4—PLANT "D"
Smackover Gas Oil Cracking in Two Jenkins Units—1,440 Hours on Stream per Battery

Fractions:	Total Barrels	Per Cent Throughput	Per Cent Ultimate Yield	Average Total Barrels per Day Per Still
Charge	71,494	100.00	.....	1,197
Straight gasoline	21,032	29.41	63.62	351
Recycle stock	38,438	53.62	.....	641
Fuel oil	8,300	11.69	25.09	138
Loss	3,724	5.28	11.29	67

	Gasoline	Reboiler Bottoms	Recycle Stock	Residuum	Charging Stock	Fresh Stock
Gravity	48.4	29.0	24.0	14.1	27.8	33.5
I.B.P.	136	423	378	406	408	422
10%	212	477	456	484	472	474
20%	252	485	492	506	492	492
30%	281	496	507	528	510	504
40%	307	500	520	550	526	516
50%	328	506	536	579	542	532
60%	350	514	557	618	561	550
70%	372	523	578	662	581	567
80%	389	536	606	696	612	592
90%	412	559	660	700	654	627
95%	...	589	731	702	680	660
Maximum	440	613	C.	C.	710	688
Recovery	98.5	C.			C.	C.

	Gum	Sulphur	Carbon Residue	Viscosity Furol 122	Unsaturates	Cold Test
Heavy gaso.	26.7	.106	....	.....	13%	...
Reboiler bottoms	.....	.573	.04	.....	9%	BZ
Recycle stock	.....	.960	.085	.....	14%	BZ
Residuum	.....	1.34	.....	11.3	...	BZ
Charging stock	.....	.791	.068	.....	13%	BZ
Fresh stock	.....	.426	.022	.....	3%	BZ

TABLE 5—PLANT "E"
Mid-Continent Gas Oil Cracking on Two Jenkins Units—Time on Stream, 1,443 Hours

Fractions:	Total Barrels	Per Cent Throughput	Ultimate Yield	Av. Total per Stream Day Per Still	Av. Total per Calendar Day Per Still
Total charge	76,390	100.00	.....	1,270	1,232
Straight gasoline	22,650	29.65	61.00	376	365
Total gasoline	25,120	32.88	67.66	417	405
Recycle stock	39,260	51.40	.....	653	633
Fuel oil	9,940	13.01	26.77	166	161
Liquid loss	2,070	2.71	5.57	34	33

	Fresh Stock	Recycle Stock	Charging Stock	Straight Gasoline	Pressure Distillate
Gravity	32.9	29.9	30.1	62.8	42.3
I.B.P.	353	320	400	90	332
10%	503	488	500	144	380
20%	538	517	588	180	398
30%	562	538	615	207	409
40%	585	552	636	230	418
50%	610	578	657	254	428
60%	635	597	679	277	436
70%	664	624	703	294	446
80%	712	656	728	314	462
90%	740	705	760	349	492
95%	...	...	...	378	...
E.P.	...	745	...	395	570
Recovery	...	...	...	97%	...
Doctor	...	...	...	SW	...
Color	...	...	...	28	...

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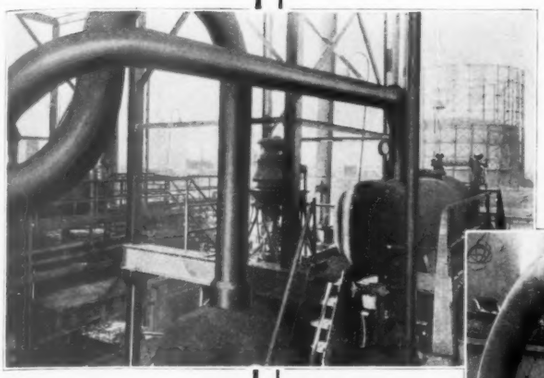

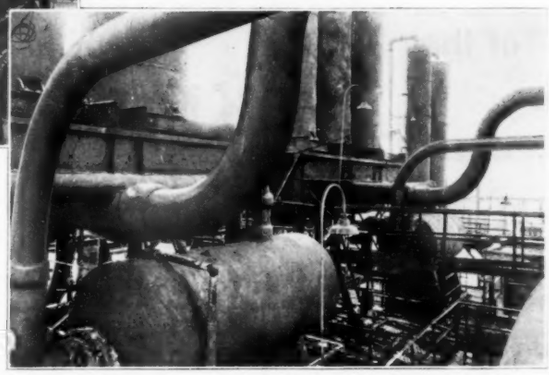

Illustrated is one of the several installations of Limbert fabricated piping used by Graver Corporation for the Jenkins Cracking Process.

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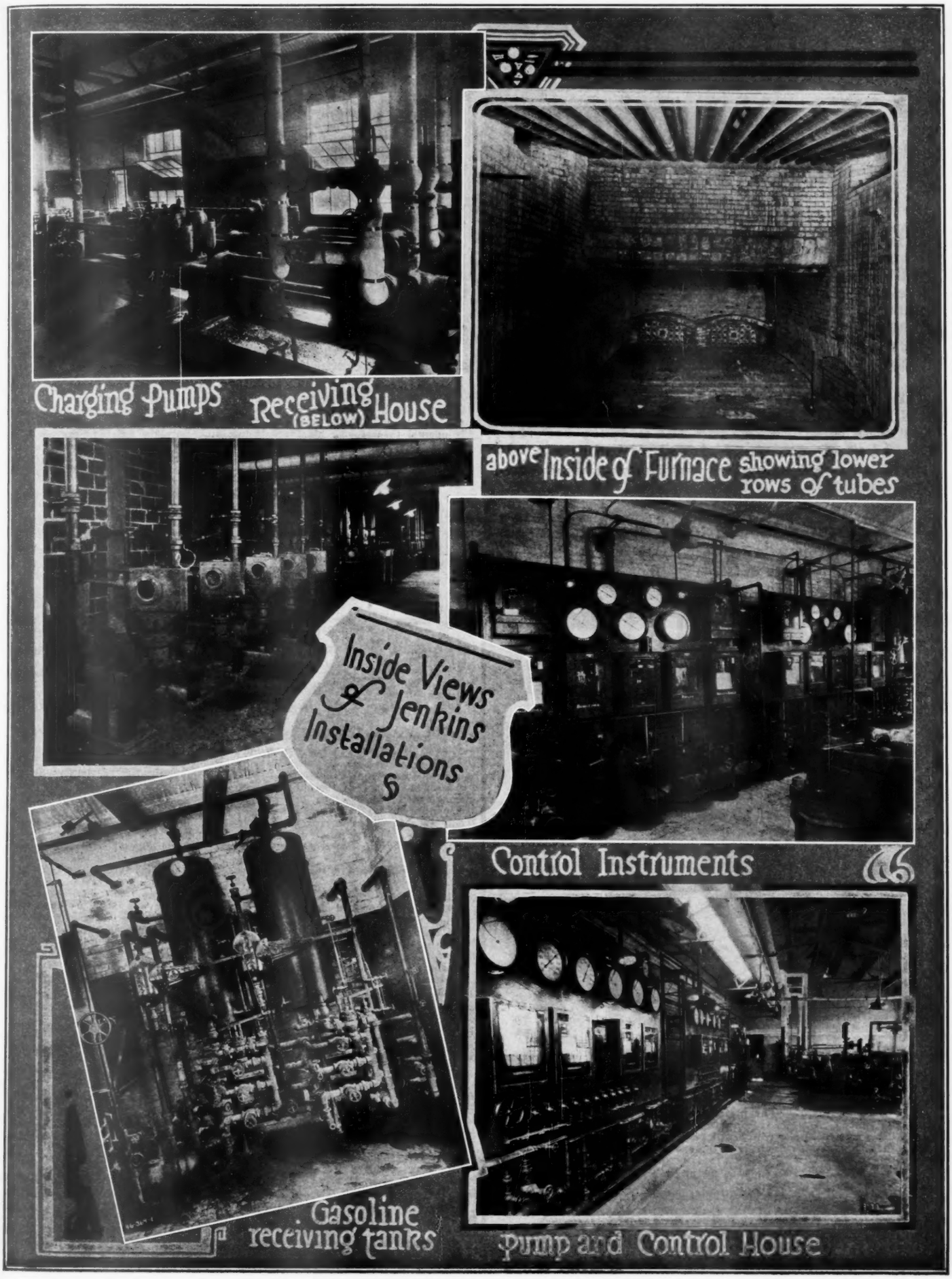
Charging Pumps
Receiving House (BELOW)
above Inside of Furnace showing lower rows of tubes
Inside Views of Jenkins Installations
Control Instruments
Gasoline receiving tanks
Pump and Control House

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Chart the vapors from the No. 2 bubble tower can be passed to either one of the vapor towers or split between the two. In passing the vapors from the bubble towers through the towers some of the heavy ends are condensed. This condensate in the Jenkins installation is collected and pumped to the reboiler. The lightest ends are vaporized in the reboiler and are returned to the bubble tower. The heavy ends become a part of the recycle stock. This method of handling the condensate adds materially to the ultimate yields from the cracking operation. The vapor towers where they have been installed with the Jenkins units have also reduced the treating costs.

Yields Obtained

In order that the reader may know the yields obtainable in the Jenkins operation, including length of operating cycle, fuel consumed and specifications of the finished products the accompanying tables based on five operations were prepared. These tables which are based on actual plant operations are representative of results obtained over a long period of operation.

Attention is first called to Table 1 which is based on the operations of Plant A. So far as the writer knows this operation has no parallel in the refining industry. This plant is located in the central part of the United States. Due to the market conditions the owners generally operate the cracking plant to obtain only gasoline and fuel oil. The refinery does not operate a skimming plant, all of the charging stock being purchased from other refiners and transported to the plant by tank cars.

The charging stock on which Table 1 is based consists of Seminole crude oil, a 24-26 A.P.I. gravity fuel oil purchased from an Oklahoma refiner and a small amount of gas oil. This gas oil was used only in this operation, the cycle being 612 hours. Of the total of 18,597.76 bbls. of fresh oil charged to the unit during that period, 64.4 per cent was crude oil, 32.3 per cent fuel oil and the remainder gas oil.

In this operation 65.56 per cent of the raw oil was converted into 59.9 A.P.I. endpoint gasoline with an endpoint of 424 degrees Fahrenheit. The plant did not market any of the intermediate products shown in Table 1 but all naphtha, reboiler bottoms and recycle stocks ultimately were converted into gasoline and 12 A.P.I. gravity fuel oil. The loss in this operation based on the original charge was 2.91 per cent.

In treating the gasoline from this operation from 2 to 3 pounds of sulphuric acid per barrel of gasoline was used. An agitator equipped with a circulating pump was utilized in this operation. In the agitator after the sulphuric acid treatment, without neutralization by soda, the gasoline is mixed with fuller's earth. About 1 pound of the earth is used per barrel of gasoline. After a thorough mixing the earth is removed from the gasoline by a filter press.

In this operation the crude oil and fuel oil are mixed with the recycle stock of the process. This blended charging stock contains about 10 per cent gasoline.

This mixture is first preheated through recovery of heat from the Jenkins products. The preheated mixture is then fed into the still in the conventional manner. The light ends of the crude oil charge are vaporized before the charge enters the cracking still and pass through the bubble towers along with the vapors from the cracking operation.

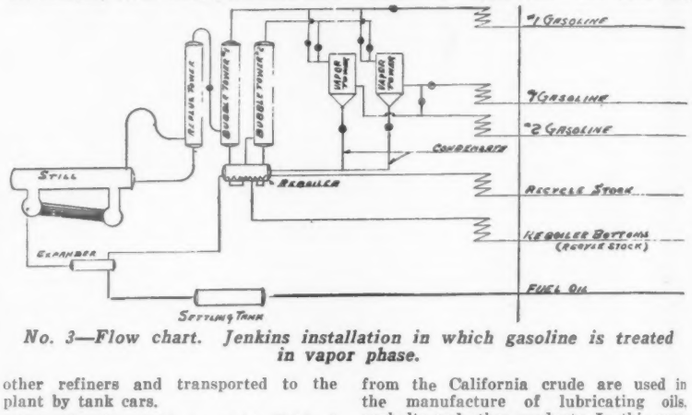
This method of operation under the present market conditions covering crude oil, fuel oil, gas oil and gasoline has proved to be profitable despite the high transportation costs incidental to the movement of the raw crude and the fuel oil from Oklahoma to the cracking plant. This plant has also operated on straight gas oil.

Panhandle Crude Oil

The operation which is summarized in Table 2 is also based on crude oil as the fresh charging stock. The crude oil was obtained from the Panhandle Field of Texas, a crude oil which has been found to be difficult to refine either in a cracking or skimming operation due to the presence of sulphur compounds.

With a mixture of 67 per cent recharging stock and 33 per cent Panhandle crude oil the combined oils contained approximately 10 per cent gasoline based on a skimming operation. The cycle of operation was 252 hours during which 6,905.06 bbls. of fresh oil was charged to the still. From this charging stock 4,068.80 bbls. of gasoline were obtained of which approximately 75 per cent was cracked gasoline.

Plant C is operated in the Far East on gas oil obtained from California crude oil. Only the overhead gas oil is used as charging stock for the cracking units due to the fact that the refinery is complete in its operations. The other cuts from the California crude are used in the manufacture of lubricating oils, asphalts and other products. In this operation an ultimate gasoline yield of 62.7 per cent was obtained from the gas oil.



No. 3—Flow chart. Jenkins installation in which gasoline is treated in vapor phase.

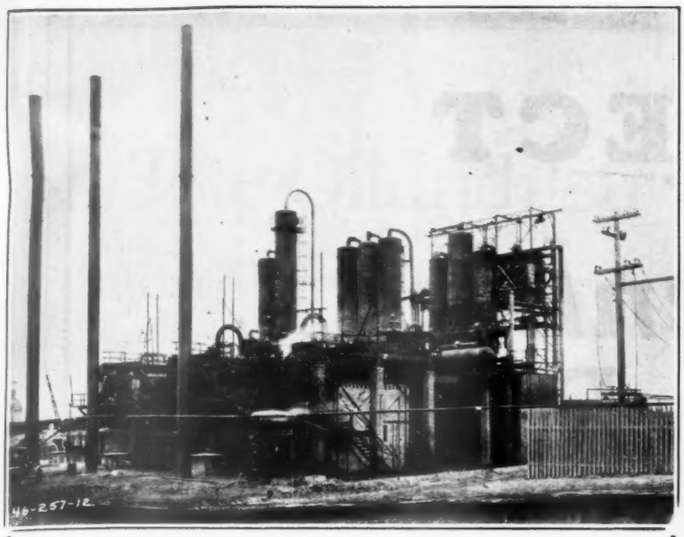
Smackover Gas Oil

In Plant D, Table 4, the gas oil cracking stock is secured from the fuel oil residuum obtained in skimming Smackover crude oil. This fuel oil is reduced in a pipe still. Two Jenkins units are in operation at this plant. Operated as a battery these two units were on stream for one month. The gasoline yield from this oil gas was 63.62 per cent. This gasoline while low in gravity has a relatively low initial and endpoint so that it can be easily blended into a finished motor fuel. Incidentally, tests of this gasoline showed that it had a very high antiknock value.

Finally in Plant E (Table 5) the reader has the representative yields obtainable from Mid-Continent gas oils. In 1,443 hours on stream the average per calendar daily throughput of the two units was 1,232 bbls. From this gas oil the average yield was 67.66 per cent.

The operations on which the five tables are based cover a period in which exceptionally low prices have prevailed for both crude oil and refined products. A period of depression such as existed in the petroleum industry for the past several months is reflected in the method of operating cracking units as it is in every other phase of refining.

It is probable that with more normal prices some changes will be made in the method of operating the Jenkins units both as regards to the type of charging stocks and yields of finished products obtained. The flexibility of the Jenkins installations permits the operators to make whatever changes are necessary.



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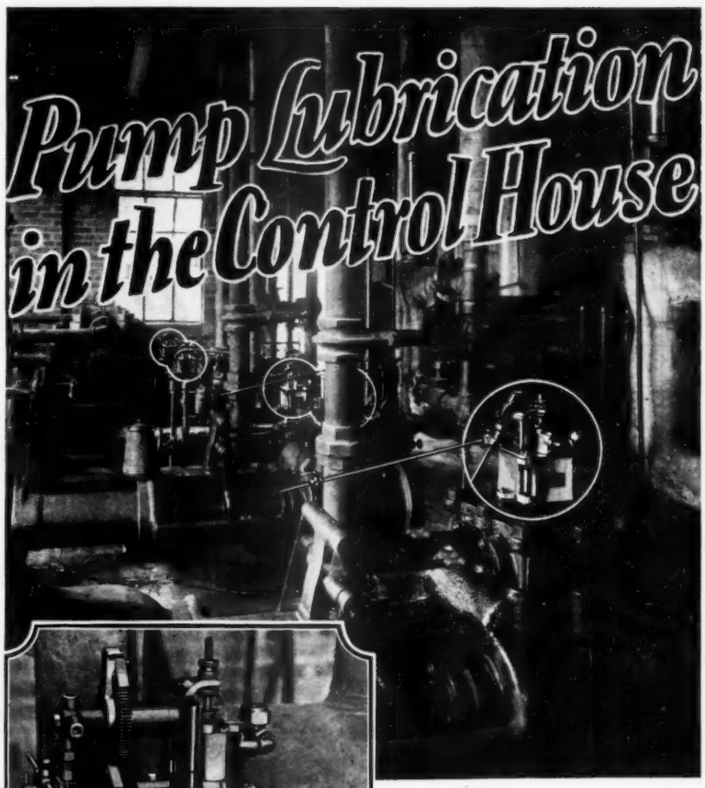

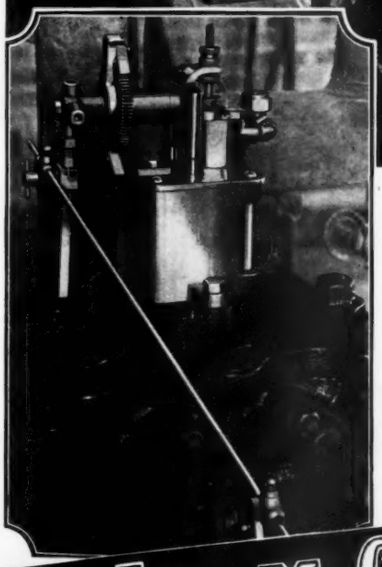

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Gasoline and Crude Price Relationship
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Drilling Costs Increase 300 Per Cent
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Great Service Rendered During the War
Trying Hard to Reduce Fire Losses
More to Drilling Than Boring a Hole
How Gasoline and Kerosene Are Made
Large Saving From Standardization
How Competition Dictates Prices
State Gasoline Tax Increase Rapid
Waste Almost Unknown in Oil Fields
Great Progress in Refining Oil

THE PLACE

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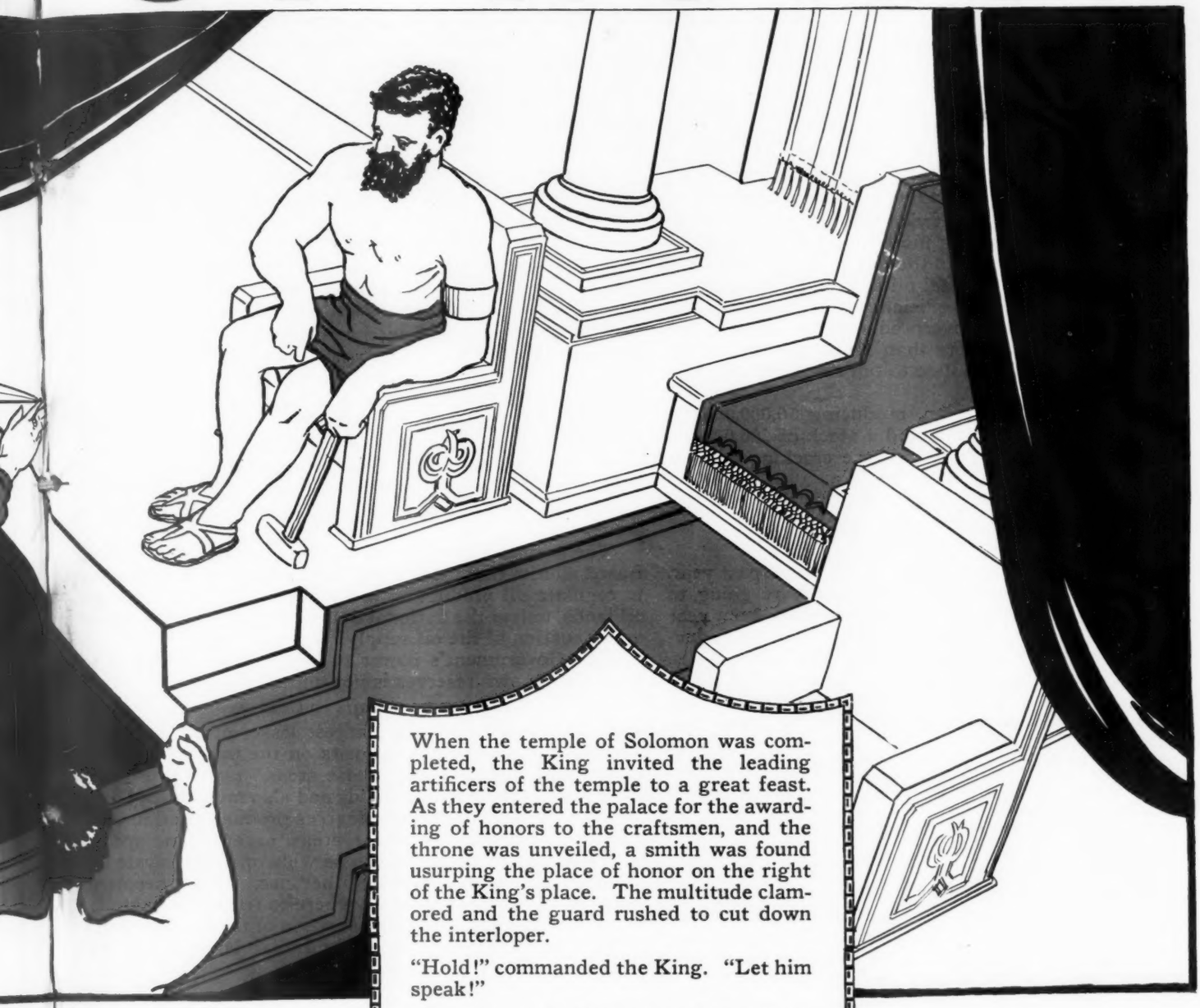


When the temple of Solomon was completed, the King invited the leading artificers of the temple to a great feast. As they entered the palace for the awarding of honors to the craftsmen, and the throne was unveiled, a smith was found usurping the place of honor on the right of the King's place. The multitude clamored and the guard rushed to cut down the interloper.

"Hold!" commanded the King. "Let him speak!"

"Thou hast, O King, invited all craftsmen but me," said the forger of iron, "yet, how could these builders have raised the temple without the tools I fashioned?"

"True!" decreed the Wise King. "The maker of tools has won the place of honor!"

TOOL COMPANY

The Oil Industry's Answer Today

By W. T. Anderson

The Oil Industry's Answer in 1924 that gasoline was the cheapest of all commodities before the war, during the war, and since, was so convincing that the motoring public generally has accepted it.

The oil industry's answer today is that there is no more need for government control of crude oil production than there was for government control of gasoline.

The industry is doing a better job of conserving our oil supply than anyone outside the industry could attempt.

It is recovering more than twice as much gasoline from a barrel of crude. It is saving more than a billion gallons of natural gasoline a year from the gas at the oil wells. It is extracting gasoline from fuel oil instead of from crude.

Had it not been for this efficiency on the part of the industry there would be no overproduction of crude today. It would have taken far more than all of our 900,000,000 barrels to have supplied gasoline to run the 23,000,000 cars owned in America.

After 67 years of operation, producing 10,000,000,000 barrels of oil, we have accumulated a stock of 500,000,000 barrels. But in three recent years the cracking process alone saved 585,000,000 barrels of crude.

And this is the industry they charge with waste and want the Government to control.

No Waste in Field

Of course, there has been overproduction this past year. Early in 1926 it was a question where we were going to get enough oil. Consumption increases steadily from year to year. We had six months' supply in storage but production from existing wells declines right along. New wells, new fields must be found if supply is to be assured.

And, as has always been the case, the drill found them. It found such an abundant supply that the industry was overwhelmed with production.

Instantly it was accused of waste. Now, as a matter of cold, sober fact, there was no waste, as the public understands waste. The public was led to believe that gushers were spouting oil that went flowing down the creeks. There was nothing of the kind.

Seminole has produced 125,000,000 barrels to date and of that vast volume not more than 25,000 barrels ever got to the ground and a lot of that was reclaimed. There was only 1 barrel out of every 5,000 barrels that ever hit the derrick floor or the earth, and part of that was saved.

Could anyone be expected to do better than that?

Cause of Overproduction

But, they say, the industry should have shut off that flood of oil. It is not quite so easy as that.

When an oil producer sets out to search for oil he must lease the right to drill. The landowner protects himself by stipulations in the lease that the operator must drill within a certain time and must protect the lease from drainage by competing wells.

When a well gets oil the owners of neighboring leases hasten to drill offsets in fear that the first driller may drain the oil from under their land, or because their lease compels them to do so. In one case the discovery of oil in a test well was immediately followed by the putting down of 91 other wells.

Then you have overproduction.

Now, how are you going to stop drilling in such circumstances?

The law gives the leaseholder the right to drill where and when he pleases, according to the terms of his lease. He may not want to drill because there is too much oil aboveground already and prices are low but if some other leaseholder there wants what he can get for his oil and insists on drilling the others must drill too or run the risk of losing the oil beneath their lease or violating the obligation of their lease to protect the landowner from having his oil taken by competing wells.

No law can deprive the landowner or the leaseholder of his property rights. How, then, is the Government or the State going to interfere?

Oil for National Defense

It has been argued that oil is necessary for the national defense and that the Federal Government has the power to keep a reserve of oil sufficient for war purposes.

Certainly, but the Government cannot take any man's property for that purpose, in time of peace, without compensation. It can buy and store oil. It can set aside oil reserves in the public domain and that is all.

There is no question of the ability of the Government assuring an adequate reserve of oil for the national defense by these methods. The pretense that the Government should take control of the oil industry to assure such a reserve is without warrant under the Constitution or in actual fact.

The preliminary report of the Federal Oil Conservation Board admits that "the power of the Federal Government to regulate oil production is doubtless limited to its own oil lands, unless the national defense is imperiled by waste or exhaustion of the oil supply."

The Government's power to buy and store oil and to establish its own reserves is not imperiled.

Government Fails to Conserve

The Government is the largest lessor of oil lands. It controls the oil and gas deposits on the public lands and on Indian lands. "Within these areas," says the Federal Oil Board, "are proven oil fields and also much unexplored territory holding in varying degrees promise of oil in commercial quantities. All these areas, except some special reserves, may fairly be said to be wide open to private appropriation through lease or otherwise. There seems to be no discretionary power anywhere to resist the exploitation of these lands and the dissipation of the Government's oil resources. The leasing of the Indian lands is progressively mandatory until exhaustion."

The chairman of the Oil Board has said that "the amount of petroleum now being taken from the public and Indian lands represents one-tenth of this country's annual petroleum recapture; the Government itself is no negligible factor in the current production of petroleum."

"It is unwise," he said, "to attempt measures for the conservation and orderly development of the oil resources of this country, with mandatory provisions of law forcing a disregard of the best interests of the Indians, the general public, the oil producers and the oil industry. We have twice asked Congress to repeal or modify this statute and to vest discretion and authority in the Department of the Interior."

These lands, he added, have been "exploited and developed under government lease, at a time when petroleum production in this country was at its peak. The Government itself is not without blame in this exploitation."

The law enacted by Congress requires the offer of at least 100,000 acres of Osage lands annually, regardless of overproduction or the price of oil. Until recently it was

required that leases be drilled within a year and it is only now that the drilling period has been extended to five years which may also have the effect of making the leases more attractive and hastening the disposal of the property.

If Congress wants to do something to regulate oil production let it begin at home, with conserving the oil it controls.

There can be no regulation of private oil production by the Federal Government on any pretext, in time of peace, under existing laws or the Federal Constitution.

Regulation by States

Some argue, however, that the states, under their police power for the general welfare, might take control of oil production to prevent waste.

But Seminole has shown that there is no waste to prevent. If the oil operators save all but a fraction of a barrel out of every 5,000 barrels produced is it possible state laws could do more?

The states, they say, have stopped waste of gas by law. The oil industry is today more interested in saving gas at oil wells and is doing more to save it than anyone else. It is supplying one-tenth of all the gasoline consumed from casinghead gas. It is immediately interested in conserving the gas pressure because it is the force that propels the oil. It is using the gas over and over again to increase the output of oil and natural gasoline.

Attempts at state regulation of oil production would run up against the same constitutional obstacle that prevents federal regulation, that no person can be deprived of property without due process of law. The ownership of oil is vested in the landowner or leaseholder and protected by his property rights. He cannot be restrained from producing his oil by any law that will hold under the Constitution.

Not Common Property

The idea that oil under the ground is the common property of the owners of the surface land finds no warrant in law. The courts have held that oil is like a wild animal, the property of whoever captures it.

It is not fixed in one spot underground, like coal or ore. It moves from one place to another if there is a passageway, being propelled by the pressure of the gas it contains. When a well is drilled and an opening offers for its escape it flows to that spot, draining places it had previously occupied.

So the first man to drill a well may drain the oil from the land across the fence or wherever it comes from, leaving none for the owner of the surface thus depleted of its underground wealth.

It is inconceivable that the State, or the Federal Government, should attempt to say to those landowners or leaseholders in any particular spot that they must consider the oil found in any wells drilled on their lands or leases the common property of all, to be divided among them.

Cannot Compel Community

In the first place, on what basis would the particular area be marked out? The oil might be drained by a well outside any area selected.

In the next place, what should be the basis of division? If acreage, a man with the largest acreage and no oil under it would get a share of the oil that had been produced from under a small property.

Voluntary agreements among landowners or leaseholders, of that sort, could be understood and would be just and fair but there would be neither justice nor equity in state or federal compulsion on that basis.

One man might think he had oil under his land and his neighbors might laugh at him. Would they be compelled to bear their share of the cost of drilling a test well or would the lone optimist be forbidden to drill his well unless on compulsion to share it with the rest?

As it is now, if he drilled and found oil, his neighbors would rush to drill to get theirs, regardless of overproduction of crude. There is just one way of checking that and it is not by government regulation but by education and co-operation.

And the industry has been getting plenty of education along that line this year in the worst depression it has ever had, due to overproduction.

The judicial definition of oil as wild game has made oil men a race of hunters. The first to the quarry got it. It was a fair game, a free field and no favors. The idea that when oil was discovered producers in the new field should come together and agree to regulate production was, of course, violently opposed by the discoverer of a field. It was fought by those who wanted the oil at any price because they wanted the money. It was protested by those whose leases were about to expire. In fact, it was altogether contrary to all the rules of the game as the industry had always played it.

Convincing Skeptics

There was a general sentiment that it would be impossible ever to get the operators in any such field to come together and agree on regulating production.

Above all, there was the deep-rooted feeling that if they did attempt any such agreement they would run afoul of the antitrust law and have the Department of Justice, the Federal Trade Commission and every politician in the country on their backs.

So the industry kept on drilling until it struck Seminole and West Texas. There had been temporary periods of overproduction before but none like this, blighting a whole year. Prices collapsed for both crude oil and refined products.

The crushing effect of that crash fell most heavily upon the owners of old wells, which constitute 75 per cent of the wells in the country with a combined production averaging less than a barrel per day per well.

Old Wells Hardest Hit

It meant comparatively little to the owners of the new flush production cheaply produced but it was an actual loss to the owners of old production, bringing the price of oil close to or under the cost of producing it. Yet it is upon these old wells that the country depends for its assured oil supply. Flush production is soon gone, leaving the settled and declining wells to maintain the output needed. Overproduction that forced the price of oil from these wells to a point where they were losing money endangered the Nation's supply more than all the "waste" they talk about.

At the same time, Seminole oil, being rich in gasoline content, was rushed to the refineries, and overproduction there beat down the refinery price of gasoline to the lowest figure since prewar days.

The entire industry thus stricken in every branch by the flood of overproduction found itself attacked as wasteful and extravagant and threatened with government control, although it was its own efficiency in making gasoline from fuel oil, getting twice as much from the barrel of crude, and saving a billion gallons of natural gasoline in the field, that had made this year's crude output too large.

Along in the spring, when there seemed no limit to the possibilities of overproduction, thoughtful oil men decided that the unprecedented situation called for unprecedented action.

Industry Acts

The Federal Oil Board had talked of government regulation, federal or state. The President had said the industry might be permitted to determine its own future.

Leaders of the industry took the Government at its word and went down to Washington to suggest that the oil producers be allowed to co-operate in keeping production within the bounds of demand.

A conference of the operating companies in Seminole was held in New York, an agreement to regulate production was reached, and an umpire named to supervise it. It is not too much to say that there were more skeptics than believers in the industry that anything practical would come out of it. The notion that rivalry was too strong for any agreement to be reached or kept in actual operation died hard.

But it died. Under that agreement Seminole production was regulated not only in the original pool but in the extensions and it was established beyond doubt that the industry could and would regulate production if permitted to do so.

Unfortunately the action was taken too late to be of greatest service. The greatest damage had been done before the agreement was thought of or could be put into effect. Existing conditions prevented its fullest development but its operations were effective within the limits of the time and conditions of application. They proved that if put into execution before flush production had got under headway agreements within the industry were the solution for the overproduction problem.

The industry itself can accomplish what cannot be attempted by either state or federal regulation. Government regulation is a socialistic theory abhorrent to American institutions. Regulation by the industry itself in obedience to the law of supply and demand is in keeping with the genius of our institutions and the enterprise of the American people.

Can Industry Be Trusted?

Of course, the question will immediately be asked, can the oil industry be trusted to regulate production with no fear of increasing prices to the consumer?

The answer to that is what the industry has done in the past five years.

It has almost doubled its production of crude oil and has increased its recovery of gasoline by one-third from every barrel of crude, practically doubling its surplus stocks and forcing the prices of its products to the bottom.

It has been more engrossed in production than concerned about profits or plain business sense would have made it curtail its output in line with consumption. It took a combination of Seminole and West Texas to convince it it was heading for disaster unless it followed the example of the steel industry and got together on a sane policy of gauging supply by demand.

No one nowadays accuses the steel business of extortion because it follows that policy. Even the Government has had to tell the farmers and the cotton growers that their only hope of getting living prices was by restricting their output to fit the demand.

What is right and proper for these industries cannot be wrong for the oil industry.

Extortionate prices in any industry carry their own destruction with them. They either reduce demand and thereby force lower prices, or they invite others into the business by the hope of high returns and competition soon lowers values.

Question of Prices

Overproduction, President Coolidge has said, in itself encourages cheapness which in turn leads to wastefulness and disregard of essential values. The public had no complaint about last year's petroleum prices. Oil today is selling below its essential value. It is worth more to any consumer for any purpose for which it is used. He could not match the same service in any other commodity at anything like the same cost.

Suppose that regulation of production in line with demand restored the prices of a year ago, would anybody think them excessive?

Cheapness is not the only consideration for a consumer. An assured supply is even more important.

This year's orgy of overproduction came perilously close to crippling the industry and an indefinite continuance of those conditions would drive a large part of it into bankruptcy. Would the public be benefited by the disappearance of that competition?

A prosperous and progressive industry can best serve the public. An industry unable to pay its way cannot do so.

The people of the United States have invested more money in automobiles than in all our railroads. Their return from that investment depends absolutely upon the continued and uniform supply of motor fuel. The oil industry has given them the cheapest motive power in history. The states have added a tax of $200,000,000 a year to the cost of gasoline and it still furnishes the cheapest transportation on earth. No method of regulation of crude oil production by the industry could increase the price of gasoline like the state taxes have done. Competition would not let it.

Tax Confuses Public

The states have simply taken advantage of the cheapness of gasoline to pile on the gasoline tax. As Chairman Work of the Federal Oil Board told the American Bar Association at Buffalo "this tax added to the retail price of gasoline has confused the public in that too often the consumer places upon the oil industry the entire blame for increased prices."

If the states levied a direct $200,000,000 road tax how many of the politicians who voted for it would survive next election? But they can take that much from the people's pockets and shift the blame to the oil industry and get away with it.

Even today, when the industry is staggering under an unparalleled overproduction, the producing and refining branches of the industry are as eagerly seeking more efficient means and methods of producing and refining oil. Nothing that will lessen the cost of production is being overlooked.

In fact we would not have had this overproduction if it had not been for the air-gas lift. Just as improvements in refining and natural gasoline manufacture have swelled our recovery of gasoline the air-gas lift has enabled operators to produce four or five years' oil in 10 months.

Industry Too Efficient

The truth is the oil industry is too damnably efficient for its own good. Even the Federal Oil Board will tell you that.

Consider that record at Seminole where heavy machinery and material for drilling 552 wells, 4,300 feet deep, was moved through all that mud and 125,000,000 barrels of oil produced with a loss of a mere fraction of a barrel in every 5,000 barrels.

Besides devising methods for increasing the recovery of oil from the sands and increasing the recovery of gasoline from the crude and from natural gas the technological staff of the industry has vastly enlarged our knowledge of finding oil. The geologists have advanced from a study of the surface indications to certainty of undersurface formations that has convinced the most hard boiled scoffer that "they know their stuff." The widespread use of the torsion balance, the seismograph and the magnetometer in locating underground structures seems as uncanny as the radio did a generation ago.

These methods have reduced the cost of exploration

and contributed to the efficiency of the whole industry in consequence.

Millions have been wasted in American industry generally through lack of standardization of equipment. The oil industry has made such progress in standardizing the equipment used in the production of oil that a government bureau says it has advanced more in two years than any other industry in 20 years.

Cheap Despite Cost

Meanwhile the cost of drilling to deeper sands has grown steadily. The average cost of a well in 1913 was $4,765. This year it is $18,725, or nearly 300 per cent more. But the price of gasoline over the first seven months of this year was only 12 per cent more than before the war. The average price since 1913 was only 20 per cent higher than in the prewar year while the price of all commodities was 56 per cent greater.

Fuel oil is so cheap that it is complained it competes with coal and its use for purposes for which there is a cheaper substitute is part of the waste charged against the industry.

It has been suggested that the use of fuel oil for such purposes should be restricted.

In other words, that the industry should be forbidden a market for its product, a proceeding that, we believe, is without precedent.

But assuming it were attempted, how could it be put into force?

Only by arbitrary control of the industry, specifying how much of each product should be made for each use and what price should be paid for each product, and consequently the price of crude oil, the basic material.

The refiners are now using fuel oil for making gasoline wherever it is cheaper than crude. It would be uneconomic to use it otherwise. To compel the refiners to get the last ounce of gasoline out of this surplus fuel, as proposed, would involve increased manufacturing cost, which would mean higher prices. Besides, this extraction of the last ounce of gasoline would still leave approximately 50 per cent of the fuel oil as a residuum product which would have to be disposed of in competition with coal.

The price of crude is now based largely on flush production, the cheapest production there is. If production were limited by law it would mean the end of cheap flush production and the stabilizing of the price of crude on the higher cost of settled production. This would mean another increase in the cost of refined products resulting from arbitrary restriction of uses.

It is not unlikely that the eventual result of an attempt at such restriction would be prices for petroleum products high enough to encourage the development of substitutes which are only postponed because of petroleum being cheaper. In that event we would have upset the entire oil industry and all the other industries, railroads, shipping, etc., that are now using fuel oil, in an effort to save oil that we then would not need. Imagine the effect upon the industries now using fuel oil if they were deprived of that advantage. One inevitable effect would be an increased demand for coal, which, freed from competition from fuel oil, would advance in price. This increased cost would undoubtedly be reflected all along the line of industry and commerce.

On the contrary, the present economic regulation by price is a direct influence for the conservation of our oil supply. Cheaper fuel oil available for cracking into gasoline lessens the demand for crude oil.

The fact that our surplus fuel oil can be disposed of for fuel helps to keep down the price of gasoline to the consumer, just as restriction upon that disposal would increase the cost of gasoline. It provides a safety valve for the industry which restriction would tie down.

As has been said in an article appearing elsewhere in this publication: "It must be borne in mind that the problem of maintaining a supply of petroleum has been one of economics—of price performing its normal function of increasing or decreasing production or consumption. A higher price immediately operates to divert the stream of petroleum into the channels of its most essential uses and so minimizes its noneconomic use and consumption. The least economic use of oil, that is, competition with coal, is directly due to price. Price, which is always fixed by competition, will be the factor about which every proposal for conservation must primarily resolve. Price finds the oil and produces it. Price controls and limits its use."

The idea that by arbitrarily restricting the use of fuel oil any material quantity of domestic crude oil could be conserved is wide of the mark. Where gasoline can be produced from fuel oil cheaper than it can be produced from crude no restriction or compulsion will ever be necessary upon the industry to do it.

Compulsory restriction invariably leads to increased prices, would "throw a monkey wrench" into the delicately adjusted machinery of the industry and benefit nobody.

Industrial economic problems are not to be solved by act of Congress or fiat of legislation.

Industry's Immense Investment

There is no industry that has given the public such complete and continuous service for so little cost as the oil industry. No other industry offers you its products not only in every town and hamlet but out on the country roads, no matter how remote. No filling station is ever sold out or asks you to come back tomorrow for what you want. In these days of hand to mouth buying the oil business is one that always has a stock on hand.

The public has no conception of the tremendous investment of capital required to insure this daily and convenient supply of petroleum products. The average motorist sees only the red pump at the filling station and visualizes nothing between that and the derrick in the field. He has a general idea that drilling is a simple operation usually resulting in a gusher, unless he has happened to put money into the company stock in which case the well is a dry hole.

He does not realize, of course, the great amount of capital consumed in the depletion of wells, the search for and development of new fields, the construction of pipe lines and tankers, the depreciation of refinery equipment and the unconscionable cost of marketing.

By way of contrast a steel mill with its huge machinery typifies a lot of money in the average man's mind. Nine people out of 10 would guess that the steel industry in the United States represents at least twice the capital investment in the oil industry.

The facts are that the president of one of the large steel corporations stated recently in a prepared address that the investment in his industry is $4,500,000,000 and its appraised valuation is $6,000,000,000. For the past 13 years the steel industry has invested an average of $100,000,000 annually, according to this authority.

The petroleum industry has an investment of $11,300,000,000. In the 16 years since the dissolution of the Standard Oil Company in 1911 it has invested an average of more than $500,000,000 per year. Last year, 1926, the industry's investment was estimated at $750,000,000.

Twice As Big As Steel

This shows that the petroleum business represents at least twice as much invested capital and has been developing at the rate of five times the new capital investment in the steel industry for more than a decade past.

Within the past dozen years more than $750,000,000 has

been expended by the petroleum industry in drilling dry holes and $500,000,000 more was put into wells that produced so little oil as to turn the investment into a heavy deficit.

The importance of this to the consumer of gasoline and other petroleum products lies in the fact that the oil industry to continue functioning must have good will and a reasonable record of consistent earnings to interest new capital. The steady expansion of the motor industry and the constant increase in demand for petroleum products means that the oil industry cannot stop work long without having its surplus capacity overtaken by the country's requirements.

It is of the utmost importance then that the oil industry become stabilized and that it should earn a fair return commensurate with its existing investment in order to be able to command a market for new securities to provide for future expansion.

Need for New Capital

Anyone can figure for himself the contrary effect of this constant nagging of the oil industry, in Congress, in the press, in the states and by the uninformed everywhere. The Department of Justice did one good thing in making war on dishonest oil company promoters and sending them to the penitentiary. But they flourished long enough to take millions upon millions of dollars from those who could least afford it all over the country. And the uninformed public does not consider that the real oil industry, the business which finds, produces and refines oil and keeps the wheels of the nation turning, had nothing to do with those who masqueraded as oil men.

The genuine oil industry has suffered from a popular resentment for which it was in no particle whatever to blame.

It has been further handicapped by its own fluctuations; its lack of stability in production. Capital hesitates to invest in a business subject to such uncertainty between feast or famine in output.

Regulation of production in line with demand would not only stabilize prices and earnings on a living basis but would attract the investment of the capital needed to provide for necessary expansion to keep pace with the growth of demand for its products.

The mere threat of state or government control of production would frighten away capital. Governmental interference with business has always been disastrous to business. There can be no initiative or enterprise in a straitjacket. And the continued finding and production of oil is absolutely dependent upon initiative and enterprise.

Set a pack of government officials on the trail of the wildcatter, hedge him around with a code of arbitrary regulations that would deprive him of the hope of reward which lures him on, and he would quit business.

Neither State nor Government would take the risks he takes. Neither would spend $750,000,000 on dry holes or $500,000,000 on wells that failed to pay out. Yet it is only by taking these chances that a Seminole is found or the potential production of a West Texas is discovered.

Overproduction must be stopped, not on the pretense that the national defense may be imperilled, or that the overproduction of even a phenomenal year like 1927 could, if conserved, have had any appreciable effect in lengthening the country's supply of oil, but because it is suicidal folly for the industry itself.

The industry has shown at Seminole what it can do but it should be done before the horse is stolen. Determined co-operation undertaken in time can avert future overproduction. It can deal better with West Texas than it could with Seminole because it can be begun at the right time.

It can be as effectively applied in California as in Oklahoma or Texas when operators realize its necessity to save the whole industry from disaster.

Antitrust Law Amendment

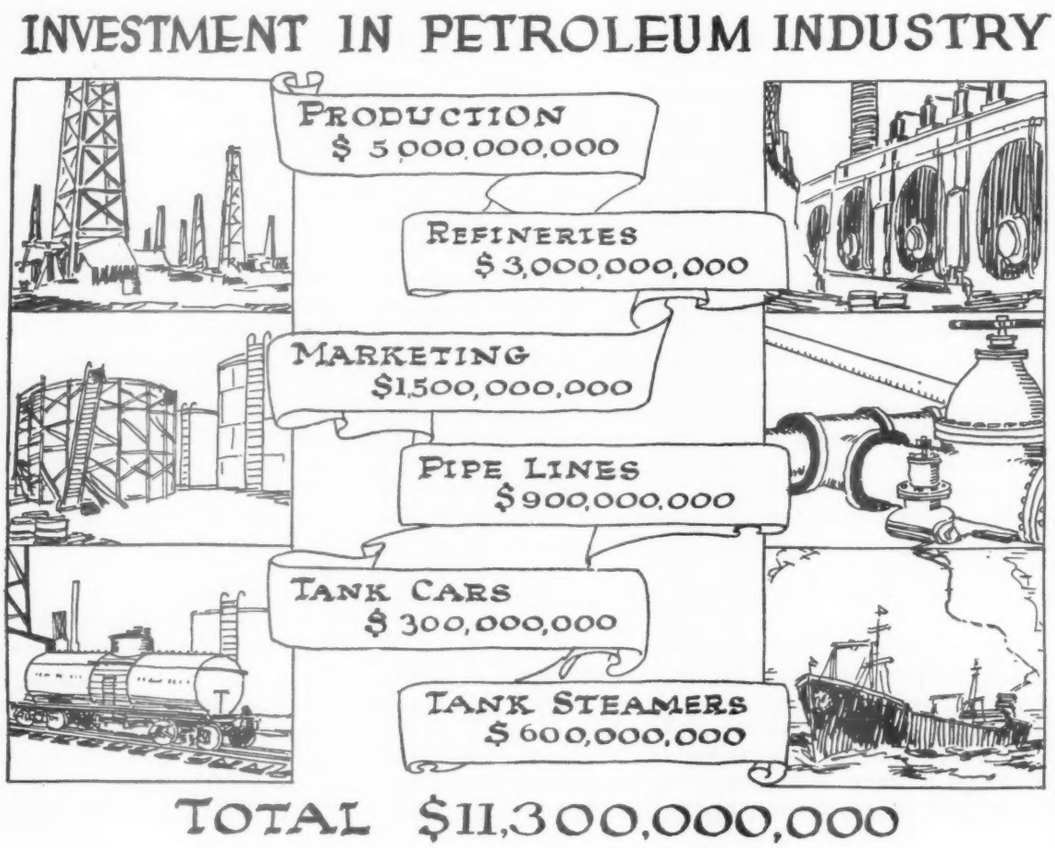
It is true that the question of the legality of co-operative agreements has not yet been determined by court test. What Chairman Work spoke of as "the uncertainty whether substituting co-operation for competition runs counter to federal or state laws" remains, a doubt which he has said "should be removed by appropriate legislation."

The drafting of that appropriate legislation might well engage the attention of his committee of nine from the American Bar Association, the American Petroleum Institute and the Government, and be recommended and even urged upon Congress by the authority of the Federal Oil Conservation Board and the administration.

That is the only thing Congress can do for the oil industry in the way of aiding the conservation of our oil resources.

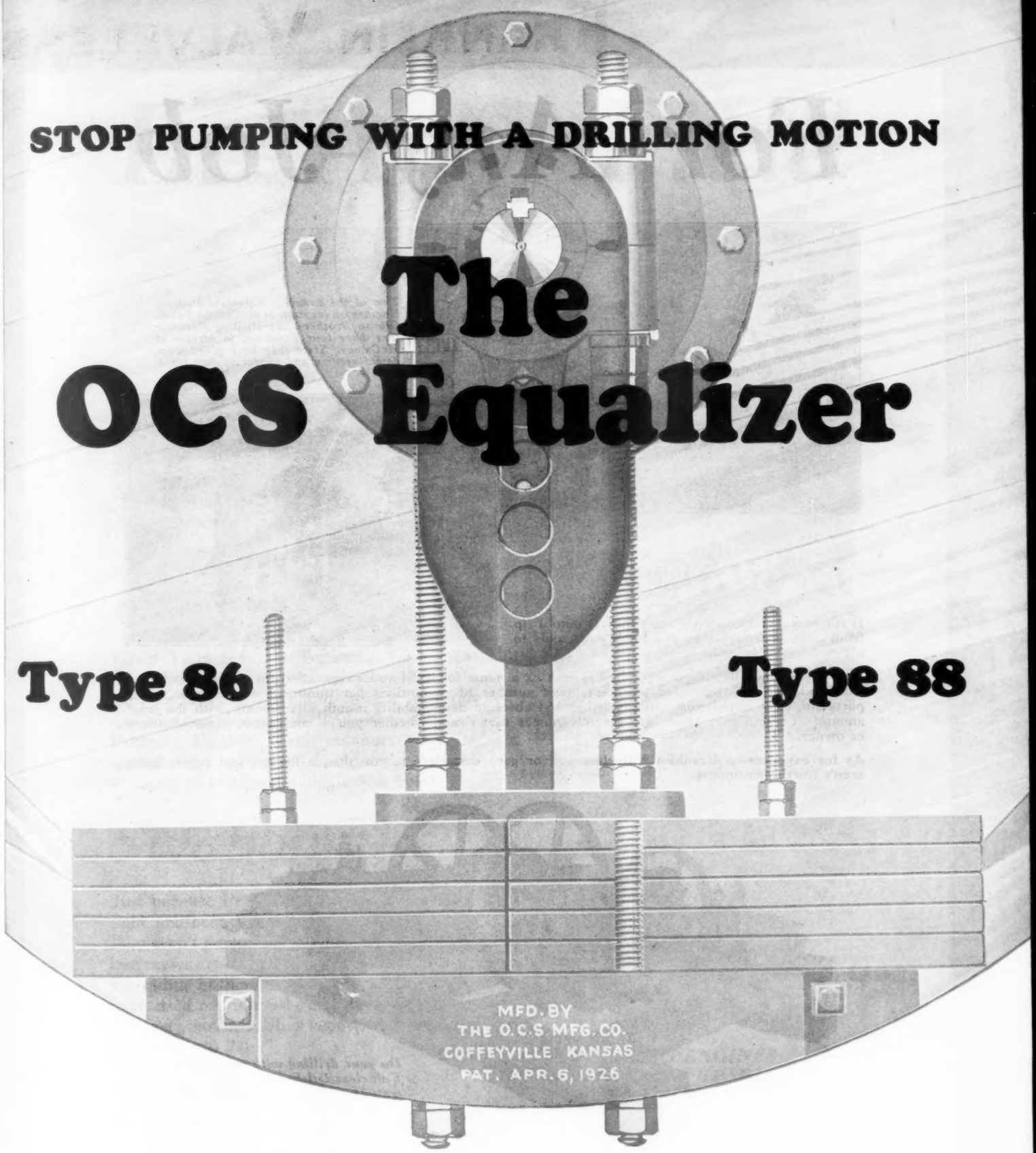
The industry has shown it knows how to conserve oil, in producing, refining, transportation and storage.

Let Congress remove the threat that hinders the fullest co-operation in conserving the Nation's oil resources.



STOP PUMPING WITH A DRILLING MOTION

The OCS Equalizer

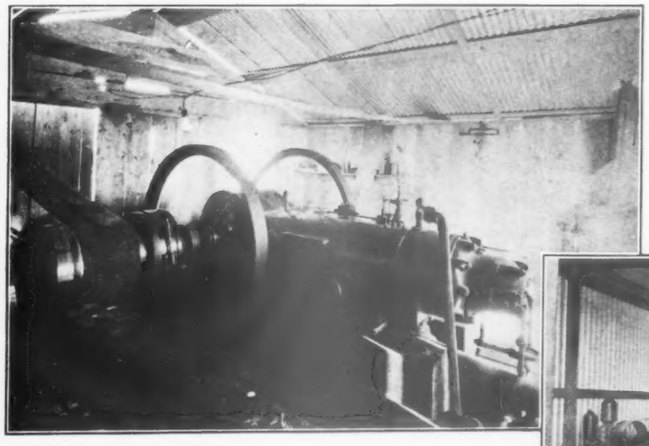


Type 86

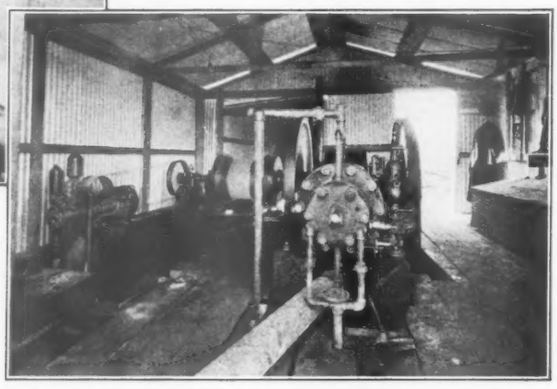
Type 88

FRANKLIN VALVELESS

For Any Job



Two of the Franklin Valveless Drilling Engines on location at McCamey, Texas. Gibson Brothers, the Drilling Contractors, have four Franklins in service at McCamey. State they have given wonderful service and expect to buy more.

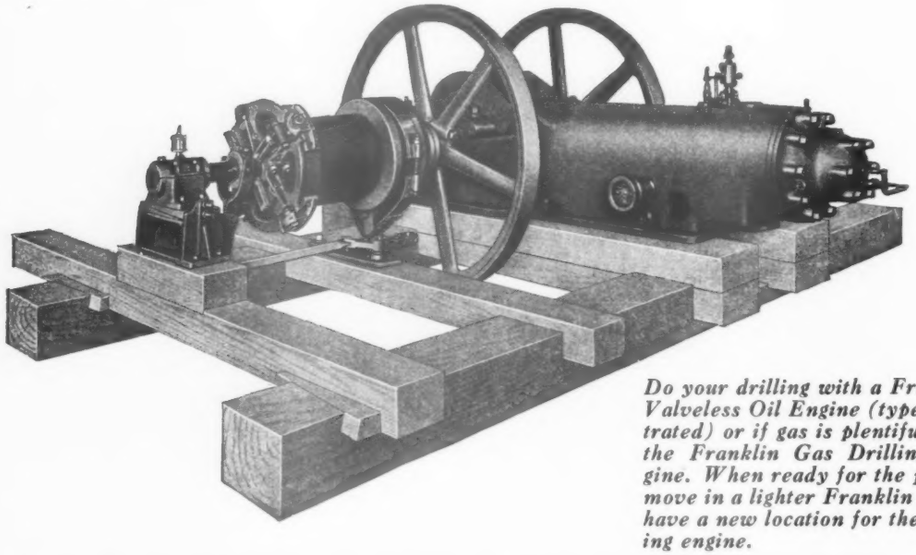


Drilling

If it's speed and economy you're after, take a tip from veteran contractors and hitch your tools to a Franklin Valveless.

This dependable, flexible power plant is making a name for itself and a reputation for its users in every worth while field. By *speed* we don't mean number of revolutions per minute, but one-truck transportation, easy installation, quick starting and absolute dependability month after month with the least amount of attention. Those are the advantages that *count,* whether you're contractor, superintendent or owner.

As for expenses—a Franklin Valveless (oil or gas) costs less to run than a flivver, and repair costs aren't worth mentioning.



Do your drilling with a Franklin Valveless Oil Engine (type illustrated) or if gas is plentiful with the Franklin Gas Drilling Engine. When ready for the pumps move in a lighter Franklin if you have a new location for the drilling engine.

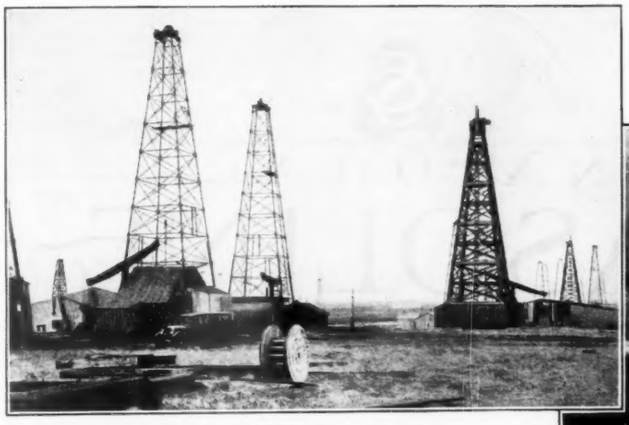
Distribu te

OIL WELL SUP

Branches in A

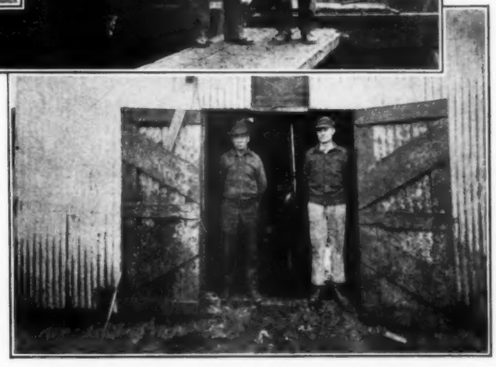
S OIL AND GAS ENGINES

In Any Field



T. B. Slick—Endicott Lease, Tonkawa, Okla. Seven Franklins in service.

J. R. Lawson—Tool dresser
W. C. Milam—Driller
on Endicott 2 E Well.



T. B. Simmons, Tool dresser, and Geo. I. Miller, Driller, with 40 H.P. Franklin Gas Engine.

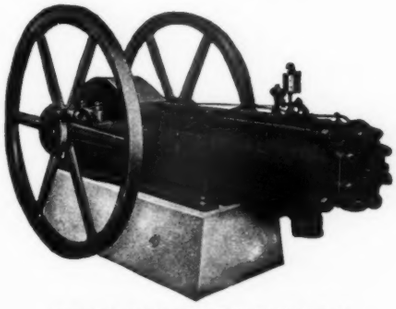
Pumping

When T. B. Slick of Tonkawa, Okla., was through drilling, he found it economical to transfer those power plants to new locations and replace them with light Franklin Gas Pumping Engines. The pumpers were installed right on the old foundations without so much as changing a single bolt hole!

Swabbing

Just because Franklin Pumping Engines are light and economical, don't get the idea that they aren't powerful. T. B. Slick, whose lease and crews are shown above, has seven 40 H.P. Franklins in this field, and four of them have been used continuously on swabbing jobs for the past year. Mr. Slick reports—"no trouble, no repairs to date."

FRANKLIN VALVELESS
ENGINE COMPANY
Franklin, Penna.



PUMPING ENGINES

25-30 H.P. and 40 H.P. Franklin Gas Engines are ideal for pumping and powerful enough to stand up under swabbing. These engines can each be mounted on the same block as the Drilling Engine without so much as changing a bolt.

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PPLY COMPANY
in All Oil Fields

NATURAL
GASOLINE
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BECAUSE OF THE GENERALLY IMPROVED QUALITY OF NATURAL GASOLINE, IT HAS FOUND A READY MARKET WITH REFINERS, NOT ONLY FOR USE IN THE MANUFACTURE OF ORDINARY U. S. MOTOR FUEL, BUT IS BEING EXTENSIVELY USED TO IMPROVE THE HIGHER GRAVITY "EXTRA QUALITY" GASOLINES

NATURALINE
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Forty-six pounds per hundred gallons lighter than U. S. fighting grade gasoline, NATURALINE presents an obvious advantage as an aviation fuel—especially in the case of long cross-country flights. It is exceedingly high in anti-knock qualities and eliminates gas-lock and the formation of carbon.

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Gasoline Is Still Cheapest Commodity

Government Figures Show Prices of All Other Necessities Have Increased More Than Automobile Motor Fuel

By Andrew M. Rowley

Of all the commodities included in the necessities of modern life, gasoline remains the cheapest and shows the least increase in price of all articles, according to government figures based on the price level of 1913. This is true not only in regard to all wholesale prices but also in comparison with retail prices, both sets of prices being compiled by government bureaus and departments.

This fact is all the more remarkable when considered in connection with the vast increase in the cost of drilling for the raw material—crude petroleum—from which gasoline is manufactured. The average cost of drilling a well in 1913 was $4,765 while at the present time it is $18,725. This increased cost of procuring the raw material is due to deeper drilling, made necessary by the depletion of fields where oil production was found at shallow depths, and to higher costs of material, labor and other things entering into the work of going thousands of feet into the ground in search of oil.

It is also remarkable when it is realized the comparison of prices of gasoline is made with prices of articles which are absolute necessities of life and which, it is conceded, should be kept at the lowest possible price to enable all to buy them. These articles include household furnishings, building materials, cloth and clothing, farm products, eggs, sugar, butter, potatoes, milk, bread, flour and coffee. Each of these articles has advanced more in price since 1913 than has gasoline, although the demand for gasoline during this period has increased many, many times more than the demand for any one of these other products.

The demand for gasoline in 1913 was 1,260,000,000 gallons while the demand this year is more than 10 times as great. Any business man knows that a big demand for an article usually results in a consequent increase in price of that article, especially when the cost of procuring the raw material from which that article is manufactured has increased so much.

Consequently, there is but one reason for the fact gasoline has remained the cheapest of all commodities in the face of rising prices in other industries and greater costs in the petroleum industry itself—improvements in methods employed in searching for the raw material; in the process of manufacturing this raw material into the finished product, elimination of all waste in the production of the raw material and the manufacture of the finished product; and holding profits down to the vanishing point.

Even during the period of inflated prices following the World War—1920—when potatoes sold at a price of four and one-half times greater than during 1913, sugar cost nearly three times as much as in 1913 and other articles more than twice as much, gasoline sold at only 70 per cent more than the 1913 price. This, too, despite the fact prices of crude petroleum from which gasoline is made, were at the highest levels in the history of the industry, Pennsylvania crude oil being priced at $6.10 a barrel and that of the Mid-Continent area at $3.50 a barrel.

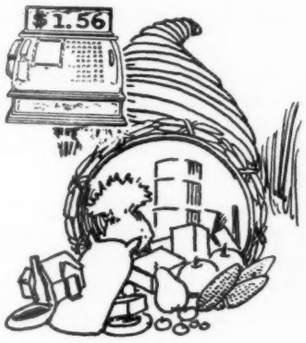
These high prices for crude oil have been considered as one result of government regulation of the petroleum industry during the war. Stocks of crude oil were so depleted during the war it was necessary to greatly increase prices of this raw material in order to stimulate drilling to provide further supplies.

Retail prices of all commodities ex-

Average Prices Public Has Paid for Necessities Since 1913

Government Reports Show Prices of All Necessities Have Advanced Since Before the War. The Illustrations Below Show What the Government Says the Public Has Had to Pay, on the Average, Since 1913, for What a Dollar Bought in 1913

Gasoline



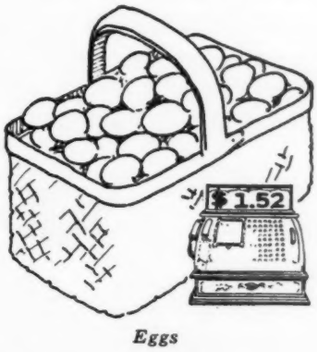
All Commodities

House Furnishing Goods

Building Materials

Cloth and Clothing

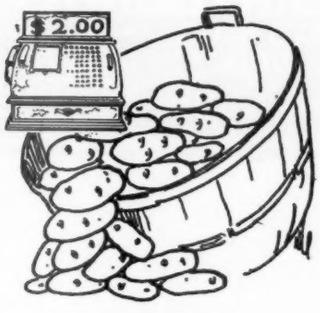
Farm Products



Eggs

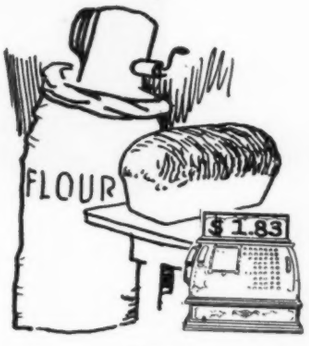
Sugar

Butter



Potatoes

Milk



Flour

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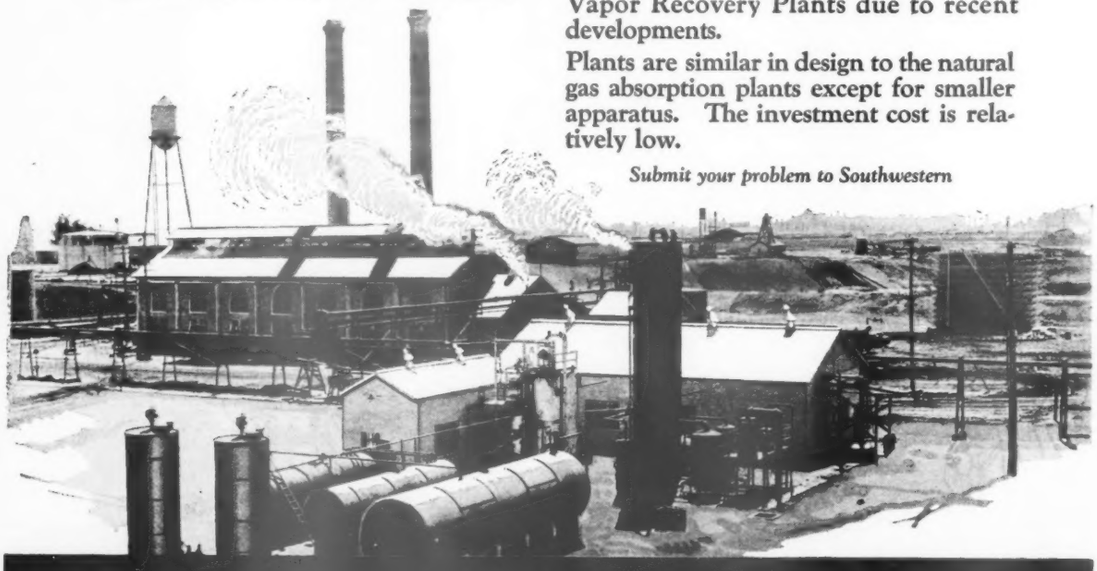
Southwestern Vapor Recovery Plant in a California Refinery



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cept gasoline show the same increase, according to government figures, as do wholesale figures. These figures, covering the past 15 years as shown in the accompanying table, are those compiled by the Government and they show that while sugar was priced at 5½ cents a pound in 1913 it cost 19.4 cents a pound in 1920, or more than three and one-half times as much while gasoline at the same time cost, retail, only 71 per cent more. Potatoes show even a gain, selling in 1920 for 3.7 times as much as in 1913, while bread cost more than twice as much. The average retail price of gasoline during this 15-year period was only 23 per cent higher than the 1913 base price while all other articles of necessity show a higher percentage of increase, the average for potatoes being just double the 1913 price.

The same situation is emphasized in the table showing wholesale prices since 1913 the average for gasoline since 1913 being just one-fifth greater than the 1913 price while the price of every other article of necessity listed shows greater increase in price.

Gasoline is better in quality than it was years ago; it is so widely distributed now that it can be purchased at almost every corner or crossroads throughout the United States; service is better at the gasoline stations and even includes free air, free water and other services; and yet gasoline has advanced less in price during the past 15 years than any other commodity in general demand.

It is difficult to understand why, in the face of these facts which are available to every person in the United States through the reports of the Department of Labor of the United States Government, there is a constant agitation upon the part of an active minority at least for investigations of the petroleum industry and regulation of its activities.

COMPARISON OF INDEX PRICES OF INDICATED COMMODITIES
By Years, 1913 to 1927, Inclusive

1913 PRICE LEVEL, 100
Compiled From Bureau of Labor and Department of Commerce Statistics

Year	All Commodities	Gasoline	Housefurnishing Goods	Building Materials	Cloth & Clothing	Farm Products	Eggs	Sugar	Butter	Potatoes	Milk	Flour
1913	100	**100**	100	100	100	100	100	100	100	100	100	100
1914	98	**83**	100	92	98	103	103.3	110.3	93.6	112.8	93.9	111.2
1915	101	**75**	100	94	98	104	100.6	130.2	92.5	74	94.8	145.4
1916	127	**121**	106	120	127	123	115.9	161.1	106.4	180.8	102.3	158.5
1917	177	**132**	125	157	175	190	161.6	180.6	134.3	313	143.1	248.5
1918	194	**139**	153	172	228	218	196.2	182.4	162.5	158.3	174.9	----
1919	206	**142**	184	201	253	231	214.7	209.4	190.7	232.3	190.5	261.8
1920	226	**170**	254	264	295	218	228.4	296.7	189.2	424.2	191.4	276.5
1921	147	**143**	195	165	180	124	160	144.3	133.7	174.8	168.8	181.6
1922	149	**140**	176	168	181	133	133.7	139.1	128.2	165.3	164.3	158.9
1923	154	**112**	183	189	200	141	139.3	197.7	148.3	142.4	171.6	139.3
1924	149.7	**102**	172.8	175.1	190.9	143.4	147.7	174.2	134.6	134	153.7	156.9
1925	158.7	**106**	169.2	175.1	189.6	158.1	163.5	128.1	142.8	205.6	172.5	192.6
1926	151	**112**	161.8	173.4	175.9	142.2	148.3	128.3	138.4	294.3	173.8	183.8
1927												
Jan.	146.9	**122**	157.4	169.7	167.3	137.2	166.1	144.3	154.5	225.9	173.6	162.8
Feb.	149.3	**121.3**	157.5	167.9	168.7	136.9	119.7	140.6	162.8	228.9	173.6	161.8
Mar.	149	**118.1**	157.4	166.8	168.4	136.6	106.2	136.6	160.5	184.6	173.6	159.8
Apr.	144.2	**112.2**	157.4	165	169.1	136.7	102.7	136.5	160	254	170.7	158.2
May	144.1	**106.3**	157.4	165.6	169.6	137.4	97.3	140.5	136.2	351.6	170.7	170.8
June	143.7	**102.2**	157.3	164.3	169.6	138.2	96.9	141.5	133.4	360.8	170.7	172.6
July	144.6	**103.1**	157.4	162.4	170.8	140.5	102.7	137.7	131.2	208.8	170.7	170.4
Average first seven months 1927	146	**112.2**	157.4	166	169	137.9	113.1	139.7	148.5	259.2	171.9	165.2
Average since 1913	156	**120**	160	165	183	155	152	166	139	200	155	183

Comparison of Retail Prices of Gasoline and Other Commodities
Compiled From Bureau of Labor and Department of Commerce Statistics

Year	Eggs per Doz.	Relative Price	Butter per Lb.	Relative Price	Milk per Qt.	Relative Price	Bread per Lb.	Relative Price	Flour per Lb.	Relative Price	Potatoes per Lb.	Relative Price	Sugar per Lb.	Relative Price	Coffee per Lb.	Relative Price	Gasoline per Gal.	Relative Price
1913	34.5	100.0	38.3	100.0	8.9	100.0	5.6	100.0	3.3	100.0	1.7	100.0	5.5	100.0	29.8	100.0	**16.6**	**100.0**
1914	35.3	102.3	36.2	94.4	8.9	100.5	6.3	112.5	3.4	103.9	1.8	108.3	5.9	108.2	29.7	99.7	**14.0**	**84.4**
1915	34.1	98.7	35.8	93.4	8.8	99.2	7.0	125.0	4.2	125.8	1.5	88.9	6.6	120.1	30.0	100.6	**12.7**	**76.5**
1916	37.5	108.8	39.4	103.0	9.1	102.2	7.3	130.4	4.4	134.6	2.7	158.8	8.0	146.4	29.9	100.3	**19.9**	**120.0**
1917	48.1	139.4	48.7	127.2	11.2	125.4	9.2	164.3	7.0	211.2	4.3	252.7	9.3	169.3	30.2	101.4	**21.6**	**130.0**
1918	56.9	164.9	57.7	150.7	13.9	156.2	9.8	175.0	6.7	203.0	3.2	188.2	9.7	176.4	30.5	102.4	**22.7**	**136.8**
1919	62.8	182.0	67.8	177.0	15.5	174.2	10.0	178.6	7.2	218.2	3.8	223.5	11.3	205.5	43.3	145.3	**24.2**	**145.8**
1920	68.1	197.4	70.1	183.0	16.7	187.6	11.5	205.4	8.1	245.5	6.3	370.6	19.4	352.7	47.0	157.7	**28.5**	**171.7**
1921	50.9	147.5	51.7	135.0	14.6	164.0	9.9	176.8	5.8	175.8	3.1	182.4	8.0	145.5	36.3	121.8	**24.3**	**146.3**
1922	44.4	128.7	47.9	125.1	13.1	147.2	8.7	155.4	5.1	154.6	2.8	164.7	7.3	132.7	36.1	121.1	**23.7**	**142.7**
1923	46.5	134.8	55.4	144.7	13.8	155.1	8.7	155.4	4.7	142.4	2.9	170.6	10.1	183.6	37.7	126.5	**19.5**	**117.4**
1924	47.8	138.6	51.7	135.0	13.8	155.1	8.8	157.1	4.9	148.5	2.7	158.8	9.2	167.3	43.3	145.3	**17.9**	**107.9**
1925	52.1	151.0	54.8	143.1	14.0	157.3	9.4	167.9	6.1	184.8	3.6	211.8	7.2	130.9	51.5	172.8	**18.6**	**112.0**
1926	48.5	140.6	53.1	138.6	14.0	157.3	9.4	167.9	6.0	181.8	4.9	288.2	6.9	125.5	51.0	171.1	**19.5**	**117.5**
Average	48.7	141.0	51.6	135.0	12.9	145.0	8.9	159.0	5.7	167.0	3.4	200.0	9.1	165.0	38.2	128.0	**20.5**	**123.0**

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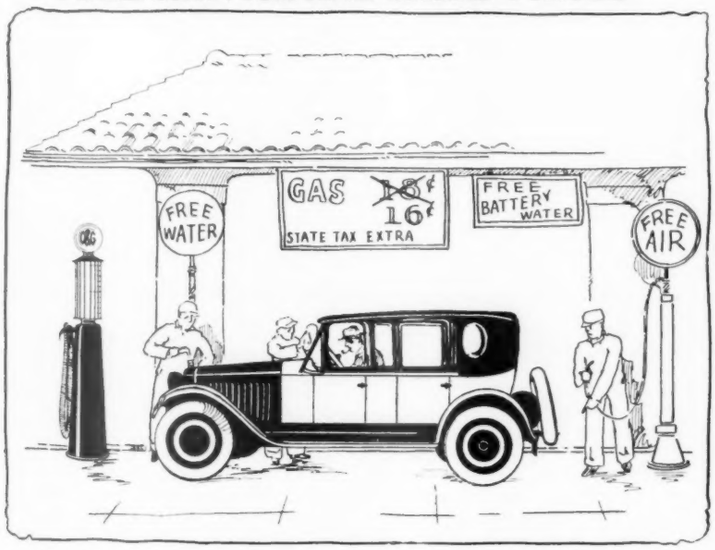

HIGH PRICES AND NO SERVICE FREE

What Can Congress Do About Oil?

Constitutional Barriers to Federal or State Regulation of the Operations of the Industry. Property Rights Protected

"I believe the time has arrived when the Federal Government should ask Congress for legislation intended to protect our oil deposits against waste in production, and the public against future high cost of oil products."

This declaration by Dr. Hubert Work, Secretary of the Interior and chairman of the Federal Oil Conservation Board, made before the Mineral Law Section of the American Bar Association last August, will be brought to the front in the coming session of Congress.

It is one of those things that are easier said than done.

What can Congress do about it?

Those who have been demanding government regulation of oil production have based their plea on the contention that oil is an essential for the national defense, that unregulated overproduction is exhausting the nation's petroleum resources and that the Federal Government under the defense and general welfare clauses of the Constitution has the right to regulate oil production.

The first thing for a congressman to do, in considering the subject, would naturally be to turn to the Constitution and look up the defense and general welfare clauses. He will find that the Preamble reads:

"We, the people of the United States, in order to form a more perfect Union, establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty to ourselves and our posterity, do ordain and establish this Constitution of the United States of America."

Can Only "Impose Taxes"

This, of course, is merely the preamble, the declaration of the purpose to establish the Constitution. The actual powers to be employed in attaining the ends specified are prescribed in the Constitution itself.

Proceeding to Section 8 of Article I, it is provided that:

"1. The Congress shall have power:

"To lay and collect taxes, duties, imposts, and excises, to pay the debts and provide for the common defense and general welfare of the United States; but all duties, imposts, and excises shall be uniform throughout the United States."

If this means only what it says, and it has been held that it does, it gives Congress power "to impose taxes" for the common defense and general welfare, and that is all.

The Government of the United States is one of enumerated powers, stated by the Constitution, and is not at liberty to control the internal affairs of the states respectively, such as oil production within the states, through assertion by Congress of a desire either to provide for the common defense or to promote the general welfare.

The power of Congress to provide for the common defense and to promote the general welfare must, therefore, be within the authority specifically granted and defined by the Constitution.

What Government Can Do

Oil is essential to the common defense and the Federal Government can assure itself an adequate supply, under the Constitution, by other means than unconstitutional control of the oil industry. It can keep the oil within the public domain, as has been done in the establishment of Naval Oil Reserves: it can buy and store oil, or it can develop the extraction of oil from shale, coal and lignite.

It has been suggested, however, that oil production might be regulated under the power of Congress to deal with interstate commerce.

The production of oil is within the states, is exclusively within the jurisdiction of the states, and is not interstate commerce. The Supreme Court has held that "mining is not interstate commerce; the ore does not enter into interstate commerce until after the mining is done."

The assumption that Congress is supreme and may assert its authority runs counter to Article X of the Constitution which states that "the powers not delegated to the United States by the Constitution, nor prohibited by it to the states, are reserved to the states respectively, or to the people."

Neither on the theory of providing for the common defense, promoting the general welfare, regulating interstate commerce, or asserting the supremacy of the Federal Government can Congress assume power to interfere with the production of oil within the states, except that on Indian or public lands over which the Federal Government has control.

Congressional Limits

The decision of the Supreme Court in the child labor case demonstrated the limits of Congressional power in that direction. Congress assumed it could prevent the evils of child labor by prohibiting the interstate transportation of products made by children. The court held that whether child labor should be employed in manufacture within a state was to be determined by the state alone and that Congress could not forbid. The power of Congress to regulate interstate commerce was, of course, recognized but the court ruled that Congress could not use that power to do indirectly what it could not do directly, prevent the employment of children in manufacture within a state.

The decision was deplored by a large body of popular opinion which wished child labor abolished but on constitutional grounds it was recognized the court could not decide otherwise without establishing a precedent by which Congress, through indirection, might completely usurp the powers of a state, centralize government and reduce the states to mere geographical divisions without local government.

In the light of the decisions of the court that production within a state is a matter for state regulation only it is evident that congressional legislation usurping control of oil production would likewise be held unconstitutional on that ground alone.

Property Rights

But if this is disputed the impossibility, under the Constitution, of Congress regulating oil production remains because of conflict with the operator's property rights guaranteed him by the Constitution. Under his lease he may drill as many wells as he pleases, where he pleases, and is obligated to drill sufficient wells to protect his lessor from drainage. He is vested with ownership of the oil (except as to royalty) produced from his wells.

The Supreme Court has held that the right to coal consists of the right to mine it. Similarly the right to oil consists of the right to produce it. It is a property right.

The Fifth Amendment to the Constitution provides that "No person can be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation."

The Fourteenth Amendment says: "Nor shall any state deprive any person of life, liberty, or property without due process of law nor deny to any person within its jurisdiction the equal protection of the laws."

These are Constitutional obstacles which oppose the theory that oil production may be regulated by the Federal or State Governments on the plea of promoting the general welfare or as an exercise of the police power.

The records show that where it is claimed a police statute of a state impinges upon the due process clause of the Fourteenth Amendment and where the Supreme Court of the United States is of opinion that the statute too greatly interferes with private property the act will be held unconstitutional.

State statutes in Oklahoma and West Virginia, designed to preserve the supply of gas for each particular state have been declared unconstitutional as violating the due process and commerce clauses of the Federal Constitution.

Constitutional Amendment

Turning from the constitutional and legal aspects of the question to the political it may be said that if the present Constitution prevents Federal control of oil a constitutional amendment might give Congress the authority it now lacks.

This procedure was undertaken in the case of the proposed Twentieth Amendment, intended to overcome the adverse decision on child labor regulation, proposed to the legislatures of the several states by the Sixty-eighth Congress, having been adopted as a joint resolution by the House of Representatives (207 to 69) on April 26, 1924, and by the Senate (61 to 23) on June 2, 1924:

Section 1. The Congress shall have the power to limit, regulate, and prohibit the labor of persons under 18 years of age.

"Sec. 2. The power of the several states is unimpaired by this article except that the operation of state laws shall be suspended to the extent necessary to give effect to legislation enacted by the Congress."

Up to the close of 1925 it had been adopted by 4 states; had failed of passage in 40 and had not been acted upon by 4 others.

That indicates very strongly by an exact parallel the fate of any proposal to adopt a constitutional amendment for Federal control of oil production. For one thing the country is looking more closely into constitutional amendments than it did a few years ago. The action of the states on the proposed child labor amendment shows a determination to uphold state rights. But beyond those considerations a proposed amendment for Federal control of oil would encounter popular opposition from two different causes.

Oil-producing states would naturally oppose the surrender of state rights over production within their own boundaries. In states which do not produce oil the public, believing that Federal limitation of production might mean higher prices for petroleum products, would certainly oppose it.

Between the two there is no conceivable chance of such a proposed amendment being ratified as required by the legislatures of three-fourths of the states.

So much for Constitutional obstacles which prevent Congress from assuming jurisdiction over the production of oil. The economic objections are just as strong.

Economic Objections

Control of production, such as suggested, to be equitable and efficient would have to be uniform throughout all oil-producing states. But since uniformity through Federal legislation is constitutionally impossible, how is it to be obtained through action by the various states? The failure to secure uniform state legislation on divorce and negotiable paper, after 20 years of effort, is an example of what might be expected.

When it came to a question of restricting production of oil within a state each state would hesitate lest another have an advantage and in the end nothing would be done.

But even if such a commission on oil production could be created what would it mean? It would mean the turning over of control of oil production to a group of political appointees who if sincerely anxious to perform their duties would have to depend upon the oil industry for information and advice, or if indifferent to their duties would be worse than no commission at all.

Having thus examined the difficulties in the way of regulating oil production by legislation Congress and the public may turn to the fundamental question what could be expected from conservation regulation even if it were possible, the question, in fact, that should first have engaged attention.

How much overproduction have we had this year? How much might have been conserved?

The concrete measure of overproduction is the addition to stocks, the oil produced over and above current requirements and consequently added to storage. Up to October 1 the total added to stocks this year was 58,000,000 barrels.

Assume that it has averaged 200,000 barrels a day, which is the figure accepted by the industry. Suppose this had been left in the ground and held as an assured reserve for the future it would mean

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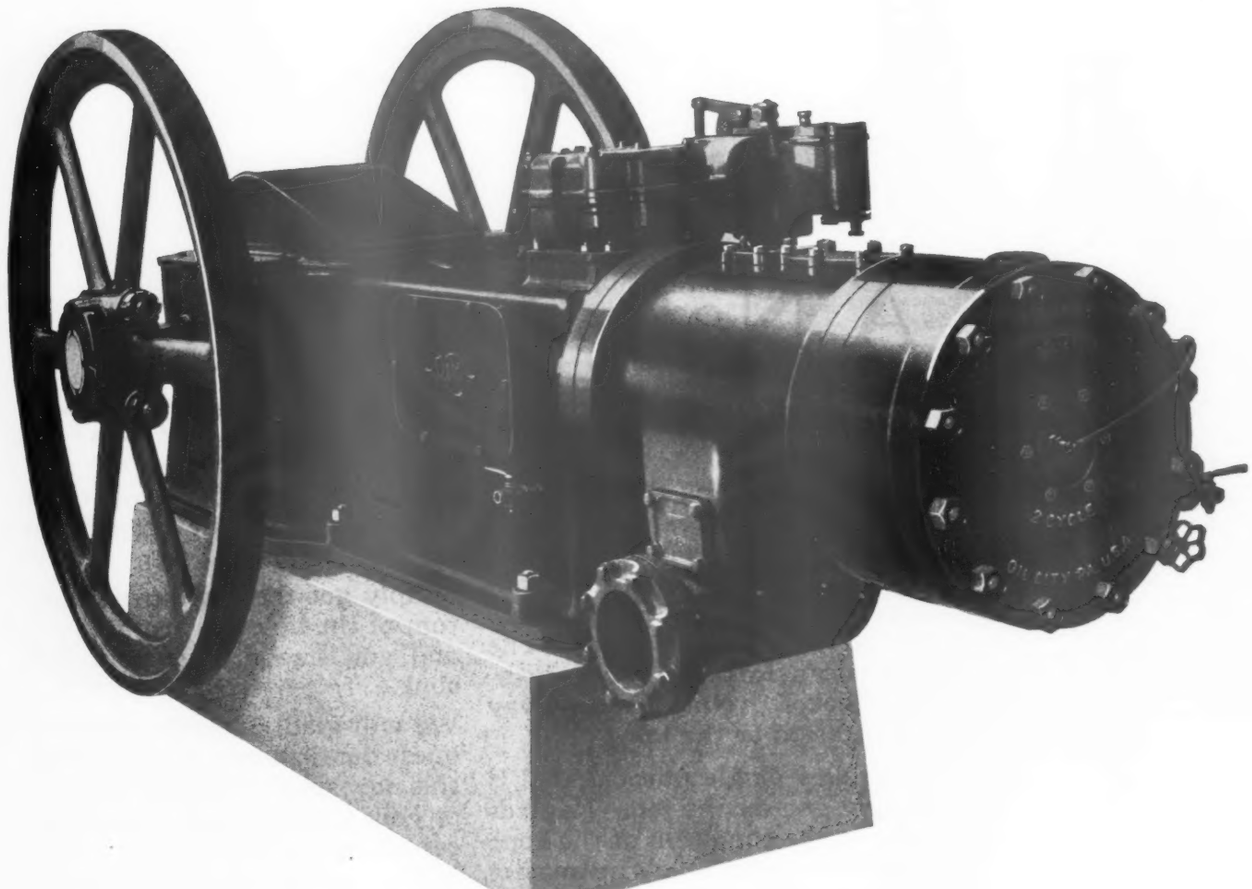

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that for the year we would have about 73,000,000 barrels put aside for use when our visible supply was exhausted.

Saving Would Be Small

At this rate it would take 12 or 13 years to conserve 900,000,000 barrels, that is, to add one year's production, to lengthen our enjoyment of petroleum 12 months.

Moreover this has been an exceptional year for production. It cannot be expected that we can add 73,000,000 barrels to reserve every year, so that to conserve the equivalent of the present year's supply would in all probability take 15 or even 20 years.

But Secretary Work has said that our overproduction runs as high as 500,000 to 1,000,000 barrels a day. Without commenting on the wide variance between these figures which shows how much of a guess it is, the chairman of the Federal Oil Conservation Board figures as overproduction all oil consumed in what he considers as unnecessary ways, such as for domestic heating.

This estimate, however, must be based on ideal universal maximum efficiency in refining, extracting the utmost gasoline from the crude and fuel oil which last would be so reduced in output that the price would prohibit the uses which the Secretary condemns as unnecessary.

Practical men dealing with commercial production of any commodity will distinguish sharply between ideal universal maximum efficiency in any industry and what is practically possible. On that basis the estimates that there is an overproduction of oil amounting to between 500,000 and 1,000,000 barrels a day is very wide of practical consideration.

No one denies the desirability and need for conservation. The oil industry itself has been the most energetic and most effective conserver of the nation's petroleum resources, even along the very lines suggested by Chairman Work's estimate.

The development of cracking has conserved over 1,100,000 barrels of crude a day; that is, the industry has produced by cracking as much gasoline as would have required, without cracking, 413,000,000 barrels a year more crude.

The present stock of crude oil is about 450,000,000 barrels. If the industry had not developed the cracking process for extracting more gasoline from each barrel of crude we would have needed every barrel of crude in stock at the first of this year to produce the gasoline made in 1927.

Industry Has Conserved

And without cracking we should have added to the overproduction of fuel oil, gas oil, kerosene and lubricating oils over 400,000,000 barrels.

An industry which has saved that much oil in one year is not to be charged with neglecting conservation.

Nor is this to be taken as the maximum conservation which it is possible for the industry to obtain in actual operation. Each year sees a further increase in the percentage of gasoline recovered from the crude. No Federal or state conservation legislation can be so effective in this regard as the industry's own efforts for its own sake to secure greater efficiency in its operations.

This has been demonstrated in its refining methods and it will be found just as practicable in the production of crude oil, if the industry is given a free hand to co-operate to that end. It has been only this year, under the stress of unprecedented production and recognition by the Government of the need for allowing the producers to deal with it in the most effective way, that the industry has been able to tackle the problem of overproduction.

Heretofore operators have been restrained from efforts in this direction by the fear that co-operation in regulating production would be deemed a violation of the antitrust acts. That fear is still obstructing the fullest co-operation and it has been suggested, even by the Federal Oil Board, that "this doubt should be removed by appropriate legislation."

No matter whether conservation of oil production will lengthen our use of petroleum 1 year or 100, it is too valuable to be wasted. No one realizes this better than the oil producer whose interest it is to conserve it. But that conservation must be attained by the operators themselves and not by rigid legislative enactment that because of the differing conditions in different fields, could not be fairly and generally applicable, even if it were constitutional and practicable otherwise.

Menace of Prosecution

The next point is what can be done to advance the interests of conservation. Agreement to restrict production in developed fields has been given a trial this year with indications that if generally adopted it would be most effective. Removal of the fear of governmental interference with such agreements and a more general understanding among operators that they can be loyally fulfilled will do much to prevent overproduction in developed fields in future.

The extension of these agreements to withhold production where mere discovery but no substantial development has been had should logically follow.

Further use of scientific means of finding oil and improvements in deeper drilling and in production practices offer additional means of controlling development.

The progress the industry has made in the past few years in scientific and technical knowledge of production assures that there will be a minimum of waste in producing or from overproduction, if the industry is allowed to run its own business.

If conservation is demanded through fear of exhaustion of our supply this increasing efficiency in production and control of output is the best guarantee that the country is going to have oil as long as it is to be found and produced.

Present methods of producing from wells are believed to produce but 20 per cent of the petroleum underground. The Bureau of Mines and the industry have demonstrated the possibility of recovering much of the oil left in the ground by water flooding and air and gas drives, bringing the oil through the sands to where it can be pumped to the surface.

Recovery of oil from abandoned fields by mining has been shown to be practicable in several fields, so that ultimately when scarcity of oil commands a price that will justify these more expensive methods of recovery the oil left behind can be brought to the surface. The volume of oil thus obtainable is estimated to far exceed all that has been used since oil was first discovered.

In addition there is the oil that can be recovered from the mountains of oil shale and by carbonization of coal, which Germany is now relying upon to supply it with petroleum products.

If the Government is so much alarmed about our future supply of oil it would seem more effective to promote the study of recovery of oil from old fields, from oil shale or through carbonization of coal, than to waste time in an ineffective effort to put the petroleum industry in a strait-jacket that will hamper production from the present wells.

Real Cause of Overproduction

Can Wildcatting Be Made Safe for the Industry by Changes in Leasing System?

By W. T. Anderson

America's supremacy in the production of oil is due to the very causes which curse the industry with overproduction, easy access to oil in the ground.

In other ages and countries the right to minerals found in the earth was reserved to the king just as today Mexico is seeking to reserve it to the government. That idea of oil deposits being apart from private rights in the surface of land is the basis of the concessions granted to explore for oil in countries abroad. In Persia, the Dutch East Indies, Venezuela, Colombia and other places there is no overproduction, because the operating companies can regulate their output to their needs.

But in the United States where ownership of the land is considered extending from the center of the earth to the sky oil belongs to the man who can find it and bring it to the surface. The searcher for oil, the "wildcatter", did not even have to own the land; he could lease from the landowner the privilege of drilling for oil.

It was this chance of "striking oil" that developed the oil industry in the United States to its present proportions. It appealed to the adventurous spirit of a pioneering people. The "wildcatter" took risks that no conservative investor would consider because if he won oil the reward might repay him for a lifetime of losses. Hope lured him on in the face of endless discouragement so long as he found the means to follow his ambition.

It was calculated in 1923 that up to that date $12,000,000,000 had been spent in this country in the search for oil and only $7,500,000,000 worth recovered. The wildcatters lost most of the $4,500,000,000 deficit.

The few who made sensational strikes were blazoned on the front pages of the newspapers. The many who lost were not "news". Nobody wants to read about the unsuccessful. And so there sprang up the great American myth about the oil business, that all you had to do was to sink a hole and get a gusher.

But these indomitable pioneers who scattered over the length and breadth of these United States pursuing the will-o'-the-wisp of petroleum to the remotest corners and the most inaccessible regions have been responsible for our riding as a nation in limousines today. If there had been nobody to take the risks they took oil production would have been limited to the few areas where it was easily discovered and we would not have had the 325,000,000 barrels of cheap motor fuel that have put the motor car within the reach of 23,000,000 American car owners.

For 30 years after Drake's discovery a few eastern states thought they had all the oil in the country. It is an old story how one of the leading oil men of the day offered to drink all the oil that would ever be produced west of the Mississippi. The wildcatter had no such set opinions. He left it to the drill to tell. And it is well for us all that he was that kind of a man, willing to take a chance.

In time the debt the industry owed to him was recognized by the operating companies. They could not afford to run the seemingly reckless risks so cheerfully undertaken by the wildcatter but when he found oil they were glad to rush in and buy leases in the neighborhood.

The cost of drilling continued to rise until the stakes became almost too high for the wildcatter—possibly $50,000 a well. With characteristic enterprise he set out to sell parts of his lease in advance of drilling to those who thought he might have a chance of getting oil. In this manner he raised enough to put down a well. If it was dry the loss was so small all around that it was not a burden and sometimes the wildcatter had sold his fractional leases for something more than the well cost, leaving him a nest egg to start a wildcat somewhere else. But if it had proved a producer the buyers of his fractional leases would immediately set out to drill offsets to get their share of the discovery. Right there is where overproduction begins.

The market may be supplied with all the crude oil it needs but so long as any one of the holders of these fractional leases insists on getting what oil he can from his lease the others in self-protection must do the same, otherwise his well may drain the oil from beneath their land.

Common sense would suggest that, if there is already enough oil on the market to meet the demand, instead of rushing to produce more, these leaseholders should get together in an agreement not to drill until there was a market for the oil. Any suggestion of that sort was immediately met with the fear that an agreement of that sort might be considered by the Department of Justice to be a violation of the laws against restraint of trade and the producers, believing themselves helpless, went ahead drilling.

This is the reason, besides lease conditions requiring drilling within a specified time, why production so often gets beyond control of the industry. Co-operative agreements or undertakings, in times of overproduction, as at Seminole, would avoid that, (outside lease drilling obligations), and would be the effective way of regulating production in line with actual demand for petroleum products, the only way in which the industry can continue to function as a solvent business organization.

The removal of the fear of prosecution under the antitrust acts is the one thing that the Government might do to aid the industry in solving the over-

production problem in this way and really conserving our petroleum resources.

It has been suggested that the wildcatter can be retained for his invaluable labor in finding new producing areas and yet save the industry from the danger of overproduction by the simple expedient of altering the form of leases bought from wildcatters.

When a wildcatter decides to drill a test on acreage he has leased it is proposed that instead of others buying fractional parts of his lease they purchase an undivided interest in his entire lease.

Suppose, for example, that 10 operators, including the wildcatter, thus come to own the entire block and the test well in common. Suppose the enterprise be managed through a committee or board representing operators and royalty owners and each participant reserves the right to claim his 10 per cent of the oil from every well that may be drilled on the property.

The test well would then be the only well drilled until the oil was needed by the consumer because no one could gain any more oil than his share of the common output. The whole incentive for rushing to drill regardless of overproduction would be removed and the oil would be left in the ground until it was needed.

This proposal was put before the Federal Oil Board last May by Messrs. Teagle and Farish who asked the board to focus immediate attention on this possibility. It has been put into execution experimentally in one or two areas with satisfactory results.

It is an example of the ability of the industry to solve its own problems if permitted to do so.

Industry Shows What It Can Do

Difficulties of Limiting Production Being Overcome by Co-operation Among Producers. What Was Done at Seminole

On November 15, 1926, the total production of oil in the United States was 2,348,676 bbls. valued at $4,278,095.

Six months later, April 15, 1927, the total production was 2,439,226 bbls., worth only $2,926,060.

This was a loss to the industry on the larger production of approximately $1,350,000 a day. Between December 1 and April 15 the loss of revenue on refined petroleum products was more than $200,000,000.

That was the situation which led The Oil and Gas Journal on April 28, in urging co-operation within the industry to correct it, to declare that "the canker at the heart of the oil industry is excessive competition, due largely to overproduction." This was an editorial comment on the letter from E. B. Reeser, president of the Barnsdall Corp., asking The Oil and Gas Journal to "open its pages for a discussion of the situation with a view of developing a plan which will prevent recurring situations like the present wasteful and almost criminal dissipation of this admittedly most important natural resource."

Industry Acts

There was an instant response which justified the declaration by The Oil and Gas Journal in its issue of May 5 that "the oil industry is going to do something about overproduction." On May 13, Messrs. Teagle and Farish placed the situation before Chairman Work of the Federal Oil Board in a letter declaring that "overproduction of crude oil, which has so often and so violently harassed the petroleum industry, has recurred this year in a form so malignant as to seem to be without precedent."

Secretary Work replied that "the Federal Oil Board would be glad to counsel and advise with the industry and do everything within reason and the scope of the law to assist." Accordingly, a committee of oil company executives was invited to meet the government board in Washington May 23.

For the first time in the history of the oil industry, and certainly since the Standard Oil dissolution decree of 1911, representatives of Standard Oil and independent oil companies met in conference in New York to discuss curtailments due to the overproduction situation. Resulting from that meeting were the following:

Agreement Reached

An agreement of the companies represented at the meeting and producing in Seminole not to start or complete any wells during two weeks in the greater Seminole area except such as may be necessary.

The appointment of Ray M. Collins of Tulsa as an umpire or arbiter to determine the necessity of any such wells and the agreement of the companies to abide by his decision.

The appointment of a committee consisting of W. C. Teagle, president, Standard Oil Co. of New Jersey; A. L. Beaty, chairman, The Texas Company; G. S. Davison, president, Gulf Refining Co.; and Col. Robert W. Stewart, chairman, Standard Oil Co. of Indiana, to work out a more comprehensive plan which would apply in all producing areas.

Many participants in the conference only agreed to meet, however, after it was determined that the Federal Oil Conservation Board saw no reason why such a meeting for the discussion of the problems could not fairly and legally be held.

Among those participating in the conference were: Henry Dawes, president, Pure Oil Co.; Judge Caster, Empire Gas & Fuel Co.; W. M. Irish, president, Atlantic Refining Co.; H. F. Sinclair, chairman, Sinclair Consolidated Oil Corp.; A. Jacobsen, vice president, Amerada Petroleum Corp.; George S. Davison, president, Gulf Refining Co.; J. E. Van Eck, president, Roxana Petroleum Corp.; Amos L. Beaty, chairman, The Texas Company; E. L. Shea, vice president, Tide Water Associated Oil Co.; W. S. Fitzpatrick, chairman, Prairie Oil & Gas Co.; H. L. Pratt, president, Standard Oil Co. of New York; R. W. Stewart, chairman, Standard Oil Co. of Indiana; J. E. Dunn, Barnsdall Corp.; James A. Veasey, Carter Oil Co., and George H. Jones, chairman, Standard Oil Co. of New Jersey.

Statement by Conference

In a statement given out after the conference it was said:

"The condition of overproduction of crude oil at the present time is not a local situation existing in any one particular district, but general, applying to Oklahoma, California and Texas. Were it not for the fact that California and West Texas production is in excess of current consumption and oil is going into storage, it is probable that the overproduction represented by the Seminole Pool in Oklahoma would have been absorbed by the industry without undue disturbance.

"Those present at the meeting, while owning the bulk of the production at Seminole, realized fully that the question of overproductin from the standpoint of conservation of our natural resources and the economic utilization of oil products, was general rather than local, and that any comprehensive plan looking to an amelioration of overproduction would not be effective if applied only to Seminole. It was the consensus of opinion at the meeting that in so far as Seminole was concerned any program adopted must be a part of the more comprehensive plan which would apply in all producing areas in which there is a prospect of large new development."

The agreement on Seminole was, however, decided upon as a test case. The government agencies, including the Department of Justice, were aware of the action. There was unanimous opinion that, in the interests of conservation, the industry should be permitted to do whatever it could. Umpire Collins made a survey of Seminole and reported to the adjourned meeting of the New York conference on May 25, definitely recommending the limitation of production on certain wells and asking that a committee of five Seminole operators be named to advise with him concerning the application of the program.

Restriction Adopted

The plan proposed by Umpire Collins at New York called for limiting the output of certain leases in the Bowlegs area of Seminole to a daily figure of 1,000 bbls. for each 40 acres contained in the lease. There were 22 wells drilling upon these leases at the time. It provided for a permitted production of 2,000 bbls. to each 40 acres contained in the lease for certain leases in the Earlsboro sector of Seminole. There were 49 drilling wells in this group. Had these wells been permitted to penetrate the Wilcox sand unrestrained, utter demoralization would have resulted. In addition to the above limitation of properties, the Collins plan called for limiting the potential production of 113 additional wells which at that time were drilling to the Wilcox sand. Out of these, 17 wells were regarded as "close in" operations, while 96 were wildcat wells scattered throughout a vast area south and west of the Seminole Field.

The Collins plan was unanimously adopted, and the owners of the drilling operations within the area affected also agreed to limit the potential output of their wells to conform to the 100-bbl.-per-day rule.

Plan Put Into Effect

This plan became effective on May 26 but the output of the Greater Seminole area continued to climb in spite of these restrictions. At the time the plan was adopted, Seminole was producing 356,895 bbls. of oil daily. The finding of exceptionally large wells caused the ouput to climb, and in the middle of July the field touched its peak of 527,000 bbls. The owners of the production again met to formulate some plan which would save the crude market from further reductions of price, and on July 28, an advisory committee of five operators was appointed to confer with Umpire Collins in working out some plan which would permit the field's output to be reduced ratably among all owners.

The committee of five was composed of J. J. Conry, general superintendent of the Carter Oil Co.; Howard N. Cole, vice president of the Pure Oil Co.; R. F. MacArthur, vice president of the Barnsdall Oil Co.; Joe S. Sidwell of the Prairie Oil & Gas Co., and E. H. Moore, president of the Independent Oil & Gas Co. To these five men and Umpire Collins must be given the credit for working out the trying problem of Seminole. At the time of their election, the field was producing 493,000 bbls. daily, and after several days' work, they evolved a plan which limited the production of the Greater Seminole area to 450,000 bbls. daily and which virtually called for a 10 per cent reduction in daily output.

Prohibitions Enforced

Under the plan proposed by the advisory committee and the umpire, the field was to be permitted to produce 450,000 bbls. per day for a period of 60 days. The torpedo wagon was to be banished from the field for a similar period, and deeper drilling of wells was prohibited. There were some oil companies which hesitated to join this movement, fearing that their help in such a move might lead to government action, the old fear of the Sherman Act being responsible for their attitude. After several days' study, the Oklahoma Corporation Commission ratified the action of the operators, and under an order of the commission, the proposals of the committee received official sanction. Immediately after this was done, the Seminole operators were uanimous in agreeing to the plan, and their attitude is best demonstrated by the fact that the daily output of the field was reduced to 451,000 bbls. on August 20, just 15 days after the Oklahoma Corporation Commission ratified the program.

Immediately after the plan was outlined, the committee was changed by the resignation of E. H. Moore and R. F. MacArthur, who were replaced by R. B. Pringle, vice president of the Independent Oil & Gas Co. and George A. Moody, vice president of the Mid-Continent Petroleum Corp.

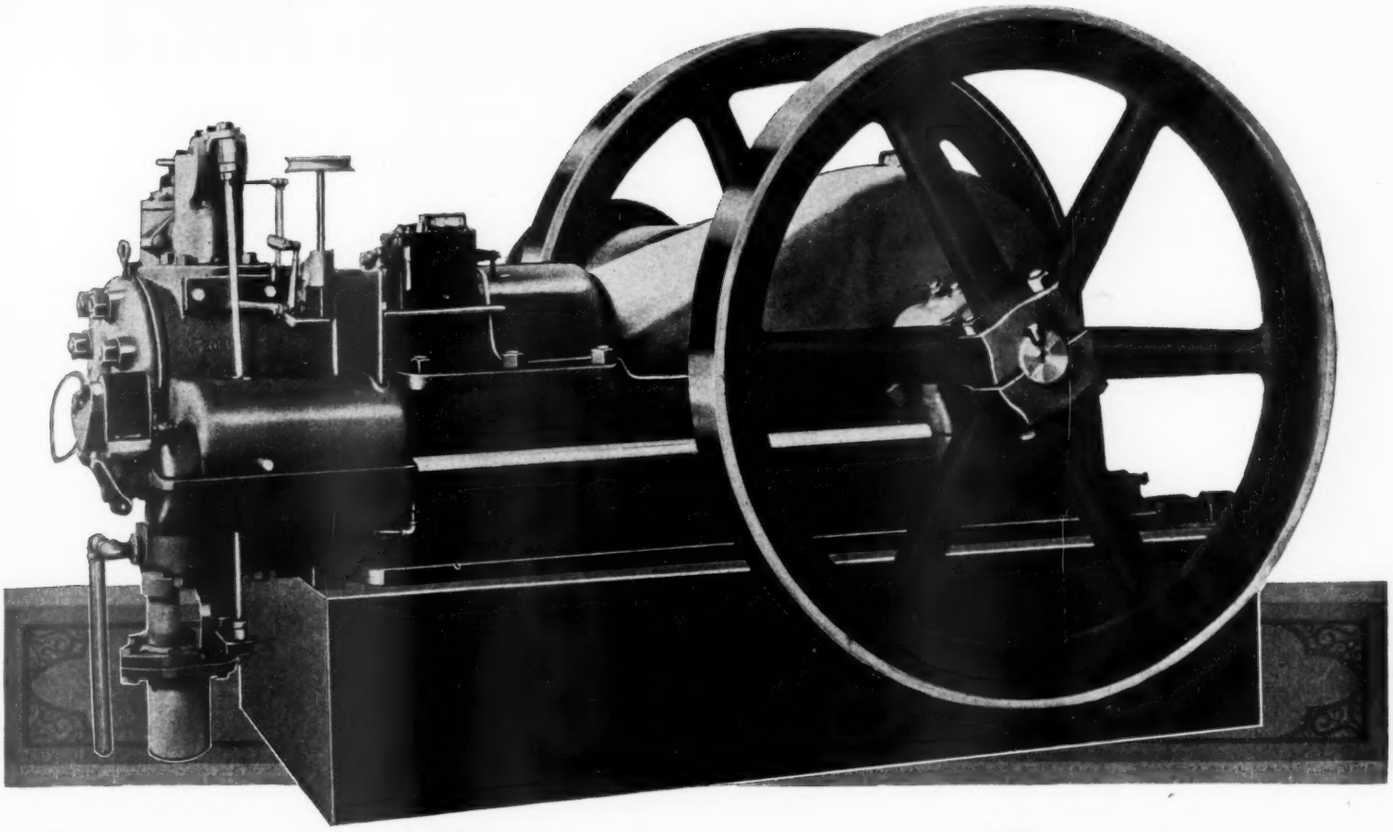
Co-operation General

In handling the proration plan, the pipe lines and the producers gave the fullest possible measure of assistance. The umpire was provided with an adequate corps of assistants, who made daily inspections of the field, ascertaining the production of individual wells and leases. Under the plan, the superintendents of the various companies in the field met daily with the umpire and his assistants; gave the reports of their wells and leases, and were advised the amount of oil their properties would be permitted to produce the following day. In making these figures, the normal decline of the wells was computed, and additional output was allowed to replace the decline.

The proration plan continued until October 5, during which time the daily production of the Seminole area had dropped below the permitted figure of 450,000 bbls. The companies rigidly observed the provisions of shooting, and when the output dropped below 450,000, the umpire and the committee joined in giving permission to shoot 100 wells which were mostly small wells. The shooitng of the wells is solely responsible for the current rate at which oil is produced in Seminole.

NO FEAR OF SHORTAGE

The estimate of 26,000,000,000 bbls. remaining in the ground within the present producing and proven areas after ordinary flowing and pumping cense, is reasonable. At the date of the American Petroleum Institute report on supply, the Nation had produced about 8,000,000,000 bbls. of oil, and it was estimated that some 5,000,000,000 bbls. were yet to come, making a total of 13,000,000,000 bbls. The estimate in question, then, assumes only that 2 bbls. of oil remain in the ground for every barrel produced under present conditions. The most widely quoted figures, several of which the Federal Government itself has issued, are to the effect that from 5 to 8 bbls. remain in the ground for every barrel recovered in ordinary practice. The estimate is significant in that there is every reason to believe that a material part of this oil will be recovered as needed by industry. It is already beginning to be recoverd under favorable circumstances and this recovery work is expanding rapidly.—Wallace E. Pratt.



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Over a Billion Spent in Dry Holes

The Oil Industry Had to Stand This Absolute Loss in Its Campaign of Keeping Ahead of Consumption

By James McIntyre

From 1910 to 1927, inclusive, a period of 18 years, 89,744 dry holes were drilled in the United States east of California. Dry hole statistics for California for the whole period were not available because, until four years ago the dry holes and abandoned oil wells were reported under the one head of "abandoned." However, since 1924, inclusive, it has been shown that the dry hole ratio in California is about the same as the average for the United States outside of California, the latter State's average for the period having been 26.3 and for the states east of it 26.9. Estimating the dry holes in California for the past 18 years at 4,000, gives us a total of dry holes since 1910, inclusive, of 93,744.

A dry hole may cost all the way from $2,000 to $125,000 nowadays. There was a time within the past 18 years when a dry hole cost as low as $50 and no higher than $40,000. That was before the days of general deep drilling and post-war prices. On a general average the cost of a dry hole in 1927, when, as we have already said, costs run all the way from $2,000 to $125,000, would be high because most of the present-day wildcat or test drilling is done in Mid-Continent territory and the Rocky Mountain district, where operating is, at the best, expensive. A $40,000 dry hole is frequent and a $100,000 dry hole is possible. Up to 1912 the majority of the drilling in the United States was done east of the Mississippi River where the sands were found at what is nowadays regarded as shallow, or relatively shallow, depths. In consequence, the cost of dry holes then was low.

Average Dry Hole Cost $9,250

A very conservative figure on the average dry hole cost for the entire period from 1910 to 1927, both inclusive, would be $9,250, and at that figure the 93,744 drilling failures would have cost a total of $867,132,000. And that was absolutely dead loss. The producers who lost that money could not make the ultimate consumer pay it directly or indirectly any more than the farmer can make the consumer pay for his crop failures. The oil producer, like the farmer, can seldom dictate the price at which he sells his product. If a producer opens a new pool he must find a buyer for his oil. The buyer generally is in a position to dictate the price. He may be a refiner or a broker who in turn sells to a refiner. The refiner makes the crude into products which in turn are handled by jobbers and then retailers. It is a long way between the producer and the consumer. This applies particularly to the individual, firm or company that is a producer only. The completely integrated organizations which produce, transport, refine and market are in a better position than the mere producer, but much of the wildcatting is done by other than the big oil companies, and by persons or companies that can much less afford the financial loss.

Wildcatting is sometimes done on a co-operative basis—that is, a number of companies will buy shares in a block of leases gathered by a man or firm that makes a business of wildcatting, under an agreement that the money they invest is to go into the drilling of a test well on a selected location, and in this way the dry hole loss is well divided, while if the test is a success the companies taking part in the operation are "sitting in" with favorably-located leases near the discovery well, which as a rule is drilled on a property retained by the wildcatting firm.

Small companies and firms are often assisted by the large companies with what is known in the industry as dry hole money. In this case the company desiring to make the test approaches the owners of nearby leases and obtains an agreement that if the test is dry at a certain stipulated depth the others will share in the financial loss. If the test is a failure the contributing companies have a better idea of the value of their own nearby leases than before at a comparatively small cost.

Dry Hole Record by Producing Division From January 1, 1915, to July 31, 1927

	Wells Completed	Dry Holes	Per Ct. Dry
Eastern fields	63,774	9,519	14.9
Central Ohio	8,080	2,331	28.8
Lima	6,349	727	11.4
Indiana	3,265	959	29.4
Michigan	260	14	5.4
Kentucky	23,267	4,186	18.0
Georgia	2	2	100.0
Florida	15	15	100.0
Mississippi	42	37	88.1
Tennessee	327	157	48.0
Alabama	6	6	100.0
Illinois	6,391	1,635	25.7
Kansas	32,224	7,839	24.3
Oklahoma	84,422	20,546	24.3
North Central and West Texas	36,541	10,479	28.7
East Central Texas	3,043	936	30.8
Panhandle of Texas	1,421	80	5.6
Gulf Coast	16,416	6,027	36.7
Southwest Texas	2,361	580	20.3
North Louisiana	8,569	2,048	23.9
Arkansas	7,011	1,142	16.3
Wyoming-Montana	5,726	1,096	19.1
Colorado	218	107	49.1
Utah	17	11	64.8
New Mexico	430	118	27.4
California	12,841	3,305	25.7
Total	323,018	73,895	22.9

A Billion in Dry Holes

But however much the dry hole losses may be divided the aggregate remains just as staggeringly large. Over a billion dollars has been spent on dry holes since the beginning of the industry in 1859. Thirty-three thousand average American families could have been well fed, clothed and housed in the two generations for the aggregate of dry hole money of the petroleum industry. Senators and members of the House of Representatives receive salaries of $10,000 a year. The oil industry's dry hole money would pay the salaries of 531 Representatives and 96 Senators for over 180 years at their present rate of salary.

Drilling for oil is a hazardous business. In the past 18 years, the dry hole average for the whole country east of California has been 22.3 per cent. In 1910, the average was 17.8 per cent. In 1924 it was 24 per cent; 1925, 25 per cent; 1926, 27.2 per cent; 1927, 28.5 per cent. Not only has the hazard slowly but steadily increased but the costs have increased beyond all proportion owing to the necessity of deeper drilling. The hazard will continue to increase and there is no hope of the expense being anything but greater as the coming years pass.

A table showing the total number of wells completed, the total number of dry holes and the percentage of dry holes by producing division from January 1, 1915, to June 30 of this year shows a wide variation of dry hole percentages, but it will be seen that the lower percentages are mostly in the older fields of the states east of the Mississippi River, which have been pretty thoroughly defined as to their petroleum possibilities. In the eastern fields (New York, Pennsylvania, southeastern Ohio and West Virginia) the dry hole average is 14.9 per cent. Out of 63,774 wells drilled since 1915, 9,519 were dry. Central Ohio shows a percentage of 28.8, but northwestern Ohio (the Lima Field) suffered only 11 per cent. Indiana, however, had 29.4 per cent of failures and Illinois 25.7 per cent. Kansas and Oklahoma suffered 24.3 per cent of "dusters," as oldtimers call dry holes. In Oklahoma out of 84,422 wells drilled 20,546 were dry and in Kansas out of 32,224 wells 7,839 were dry. North Central and West Texas show a dry hole average of 28.7 and East Central Texas 30.8 per cent. Colorado proved extra hazardous with a percentage of 49.1 of drilling failures. California suffered to the extent of 25.7 per cent (part of the period estimated.) A total of 323,018 wells resulted in 73,895 dry holes. The remainder were not all oil wells by any means. About 65 per cent were oil wells and about 12 per cent were gas wells, many of which were of doubtful value. This would give a lineup like this: oil wells drilled in 13½ years, 209,962; gas wells, 39,161; dry holes, 73,085. Gas wells may be very profitable. On the other hand, they may be so located as to preclude all chance of a market for the gas, which requires that the gas be shut in and the capital tied up, or they may be so small in volume of production that they do not pay for themselves and are later abandoned—but they are not included in the dry hole column.

Importance of the Wildcatter

That the oil industry has for 68 years been able to produce more crude petroleum than the public has been able to consume in manufactured products is due to the never flagging zeal and the boundless courage and optimism of the wildcatter.

The wildcatter is a type. Like the mining prospector, he can always see success just ahead of him. Years of discouragement cannot dull the keenness of his faith in himself and his judgment. He is omnipresent in the oil industry, but his field of operations is always outside the known oil fields. He is the pioneer of petroleum. He drills where oil is unknown. He has opened every pool that now exists. He will open all the pools of the future.

We speak of the wildcatter as "he." That is merely for convenience. The wildcatter may be a man, a group of men or a corporation. If a corporation it is the faith and judgment of some one or more men in the organization that represents the wildcatter class.

High Percentage of Failure

What has been the percentage of success of the wildcatter? Rather what has been the percentage of failure? In the year 1923, the five Mid-Continent States of Kansas, Oklahoma, Texas, Louisiana and Arkansas, 225 tests were drilled in 111 counties with 100 per cent failure to find oil or gas. A total of 614 tests in 29 other counties showed a 73.7 per cent of dry holes, and some of the wells were close to already producing leases. A total of 859 tests in 140 counties showed 81.3 per cent failures. (The Oil and Gas Journal, March 20, 1924.)

Hundreds of counties all over the land are being wildcatted in the hope of discovering new pools of oil. In The Oil and Gas Journal's semiannual review of American field operations which contains details of results of drilling in the first half of 1927, it is seen that dry holes and nothing else were drilled in the following counties located in the Texas Panhandle: Armstrong, Collingsworth, Hansford, Hartley, Hemphill, Potter, Randall, Roberts, Sherman and Swisher, 10 counties and 15 dry holes. In the West Texas Field 45 tests were drilled in 22 different counties with no results in the way of oil. The counties were Borden, Brewster, Cochran, Coke, Concho, Crockett, Culberson, Fisher, Garza, Jeff Davis, Kimble, Midland, Nolan, Presidio, Reeves, Runnels, Schleicher, Sterling, Taylor, Terrell, Tom Green and Val Verde. In Southwest Texas 52 tests were drilled in 19 counties without any oil having been developed. The counties were Bastrop, Brooks, DeWitt, Fayette, Gonzales, Goliad, Hidalgo, Karnes, LaSalle, Lavaca, Lee, Maverick, Starr, San Saba, Travis, Victoria, Williamson and Wilson. In the Gulf Coastal area in Texas 79 dry holes out of 88 miscellaneous tests were reported, but they were not reported by county. In the East Central Texas area the counties of Anderson, Ellis, Franklin, Freestone, Henderson, Kaufman, Navarro, Fannin and Falls received a total of 30 tests, all of which were dry. Now, that is only in one state—a total of 61 listed counties and 142 tests, all of them failures. In Oklahoma 22 wells were drilled in 13 counties remote from the oil region with no oil or gas results and in Kansas 14 counties received 28 tests with no results but failure. This could be continued on to other oil-producing states, but enough has been shown to indicate the scope of the exploration. None of the counties listed are less potentially oil bearing than they were before these tests were made. In many of them other dry holes have been drilled and it is safe to say that all of them will be further tested. A dry hole condemns only its own location. R. H. Smith, who opened the Wewoka Pool in Seminole County, Oklahoma, in February, 1923, and started the drilling which later developed the Cromwell, Seminole and other important pools in that part of Oklahoma had been wildcatting Seminole County 10 years before he completed his successful test in Wewoka. There were no oil wells and only nine wells drilling in Seminole County when the Smith well was brought in.

Percentage of Dry Holes Drilled East of California, 1910-27

Year	Wells Comp.	Dry Holes	Pct. Dry Holes
1910	13,656	2,436	17.8
1911	13,273	2,297	17.6
1912	16,183	2,564	15.2
1913	24,932	4,612	18.5
1914	22,470	5,337	23.7
1915	13,631	3,587	24.1
1916	23,834	3,993	16.1
1917	22,355	4,718	21.1
1918	24,926	5,733	23.0
1919	28,512	5,756	20.2
1920	33,385	7,375	22.1
1921	21,091	5,013	23.8
1922	23,759	5,329	22.4
1923	23,458	5,883	25.1
1924	20,656	4,950	24.0
1925	25,623	6,415	25.0
1926	28,222	7,681	27.2
1927*	21,280	6,065	28.5
	401,246	89,744	22.3

*November and December estimated.

Serving a World Industry
with
HUGHES TOOLS

THE growth and development of the Hughes Tool Company reflects the service this company has been privileged to perform to the petroleum industry during the past seventeen years.

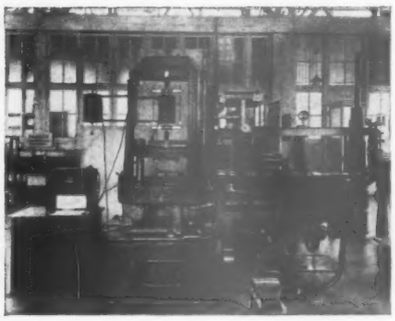
This service was only possible through untiring effort and constant engineering research work. The results of this work bore fruit in the performance and successful operation of the products given to the oil industry by the Hughes Tool Company.

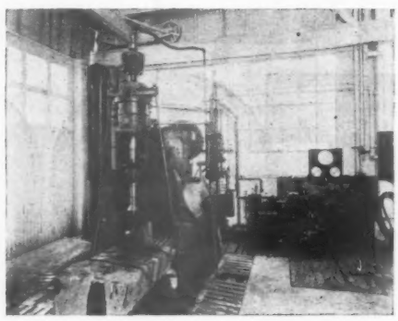
The Hughes Tool Company feels that the establishment of a completely equipped Engineering and Research Laboratory has made possible the raising of the standards of quality on all Hughes products. It is in this laboratory that the close technical supervision of the various plant processes is maintained and in many cases the specifications governing the quality of finished products made more rigid.

This laboratory functions not only from the standpoint of control, but has placed the Hughes Tool Company in a position to carry on the investigation of metallurgical and chemical problems for outside concerns. In the mechanical division of the Hughes Laboratory physical testing machines are used to determine the many physical characteristics of metals such as tensile properties, resistance to fatigue failure, resistance to abrasion, strength against shock or impact stresses, hardness, etc.

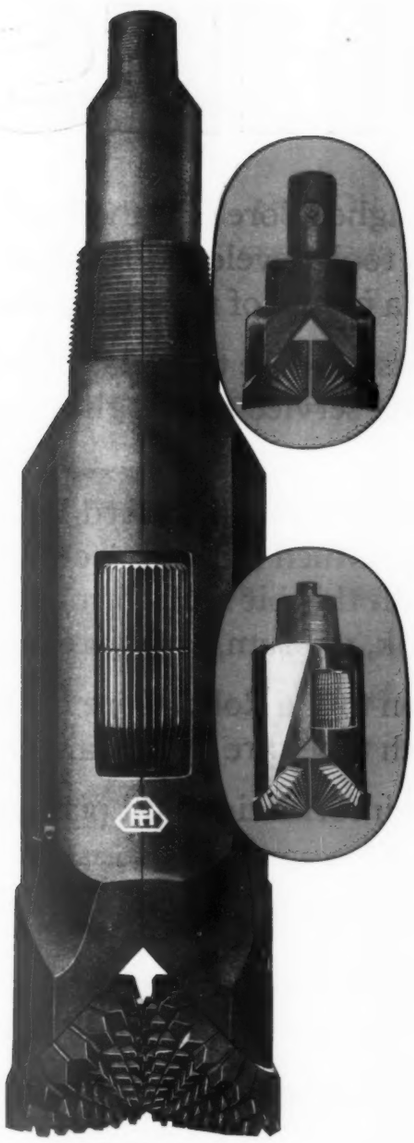
Detailed micrographic and macrographic analyses are made in the Metallographic Division of the Laboratory and chemical and physico-chemical analyses obtained in the Chemical Department.

The Hughes Tool Company presents here some of the latest improvements in oil field tools as developed in the Hughes Laboratory and seasoned by careful field tests.





The Development of the HUGHES ROCK BIT



Hughes Simplex Rock Bit equipped with Self-Cleaning Cones.

Through consistent speed and safety of performance the Hughes Rock Bit has won world wide recognition in the petroleum industry.

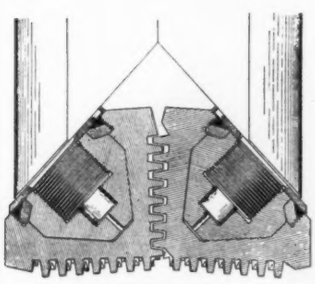
The Hughes Rock Bit of today, when compared with the bit first offered to the oil industry nearly two decades ago, gives a good example of the development and growth of the Rotary Process of Drilling.

The same basic principles that made the first Hughes Rock Bit a success are combined in the Hughes Simplex Rock Bit of today. These principles, together with the improvements of recent years, have lowered drilling costs and spread the use of the Rotary.

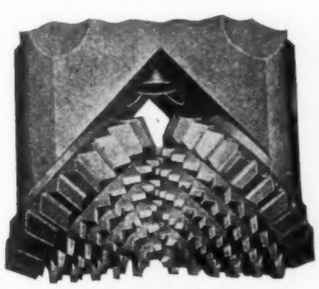
Constant improvement resulting from broad field experience acting in co-operation with laboratory research has always characterized Hughes Products. The latest improvement in the Hughes Simplex Rock Bit is the Self-Cleaning type of cone cutter.

In the Hughes Self-Cleaning Cone, the Hughes Tool Company has made available to the oil industry a cutter that has more than doubled previous records of speed and footage in such formation as chalk, anhydrite, gypsum, lime stone and shale.

With the Hughes Self-Cleaning Cone you can make "sticky breaks" without coming out of the hole to go in with a fish-tail bit.

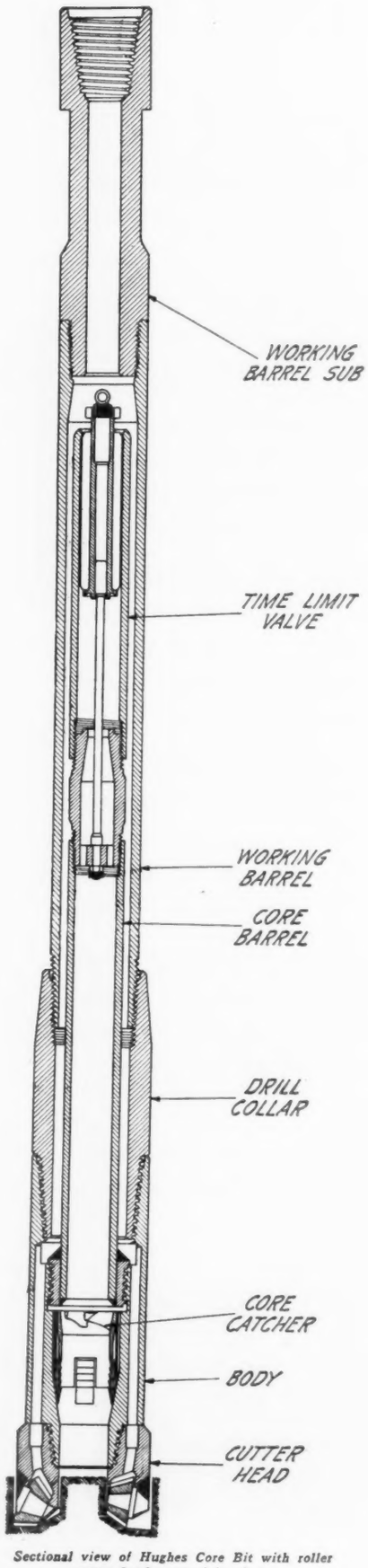


SECTION



SIDE ELEVATION

Hughes Self-Cleaning Cones



Sectional view of Hughes Core Bit with roller cutter head screwed in place.

Another HUGH Ach

HUGHES C

Oblique bottom view of Hughes Roller Core Bit Cutter Head.

View showing how Hughes Roller Cutter Head is attached to the core bit body. Note Acme thread pin and box.

IN the Hughes Core Bit, the Hughes Tool Co proven tool, developed through actual fi eld tests over a period of many months.

The success of these tools has been more th an stone in the service the Hughes Tool Comp an Industry.

When using the Hughes Hard Formation C ore formations which formerly could not be dr ille tools. With this bit such formations as gra nit drite, chalk, gypsum, and hard shale can b e c

In addition to the Roller Core Bit Cutter He ad able. Both types are interchangeable on th e C

Complete information and prices upon rec ues

1. Can handle cores in both extreme y h
2. Hard and soft formation cutter he ads (Change can be made on derrick f oor
3. Sure recovery of core.
4. Recovered core is free from contam ina
5. Can be handled with same elevato r a Over-shot Sub.
6. Has successfully taken cores in Ca ifo and Arkansas.

GHES *Achievement*

CORE BITS

Tool Company is offering the Oil Industry a
tual fi eld tests as well as stringent laboratory

ore th an satisfactory and marks another mile-
Comp any has been privileged to perform for the

ion C ore Bit you can take cores in hard abrasive
be dr illed satisfactorily except with diamond
as gra nite, basalt, sandy lime, limestone, anhy-
can b e cored successfully.

ter He ad, a Soft Formation Cutter Head is avail-
on th e Core Bit Body.

on rec uest.

reme y hard and soft formations.

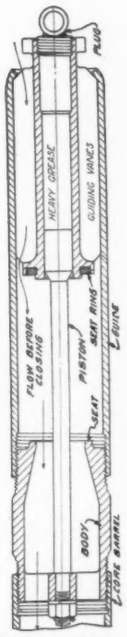
ter he ads interchangeable on core bit body.
rick f oor in few moments time.)

ntam ination.

evato r and slips used on drill pipe because of

n Ca ifornia, Oklahoma, Louisiana, Texas,

The Core Catcher for Hughes Core Bits.



Sectional view of time limit valve used in core barrel on Hughes Core Bits. Located at top of core barrel, it makes possible flushing of barrel and bottom of hole before taking core. Valve closes after 15 to 30 minutes pumping time.

Cutter Head for soft formations,— interchangeable with hard formation cutter head. (Can be substituted on regular core bit body when desired.)

Assembly of Hughes Roller Core Bit for hard formations.

HUGHES

Cast Chrome Nickel Steel DRILLING VALVES *and* FITTINGS

Hughes Drilling Valves and Fittings are products of refinement entirely in keeping with the high standard of quality of other Hughes Tools. In material, labor, inspection and tests, nothing is left undone to give to the industry valves and fittings capable of maximum performance.

This section has been cold twisted several times and the flange sections bent together.

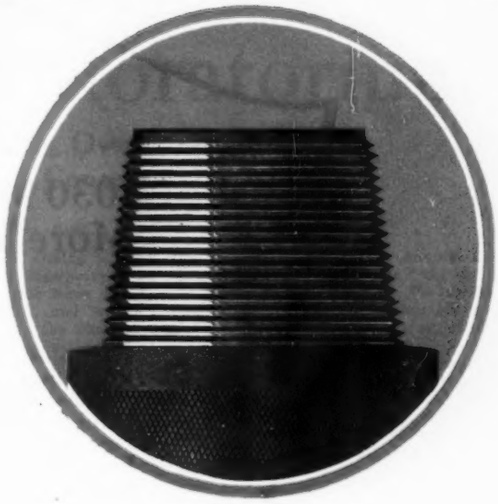
The use of special heat treated steel for every part of a Hughes Drilling Valve insures high ductility and strength and allows a light weight design for high pressures. Basic design including cylindrical body and hemispherical bonnet reduces distortion to a minimum and insures a tight shut-off.

Suspension eyes amply large to pass a cat line are placed at the center of gravity to facilitate balancing while stabbing the casing. Feet on the bottom of the body support the valve upright on the warehouse floor.

Other Hughes Features are:

—quick operating gland bolts
—self-sealing packing
—heat treated alloy steel hand wheels
—machined guides—easy closing
—lapped seats—flanges machined all over
—tapered run with shoulder to protect end of casing against hanging up of tools.
—valve stem finish-ground after machining to insure true alignment and lower friction on packing.

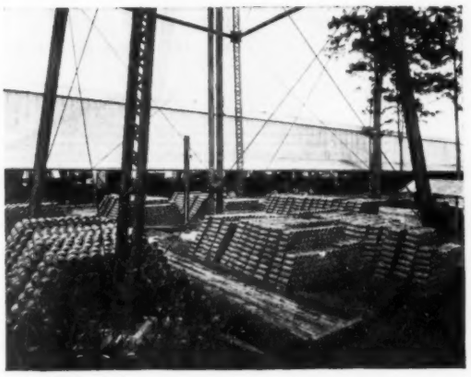
Hughes Tool Joints
—Supreme in Performance



Sustained adherence to high standards of quality has created for Hughes Tool Joints a leadership that is recognized throughout the oil fields of the world.

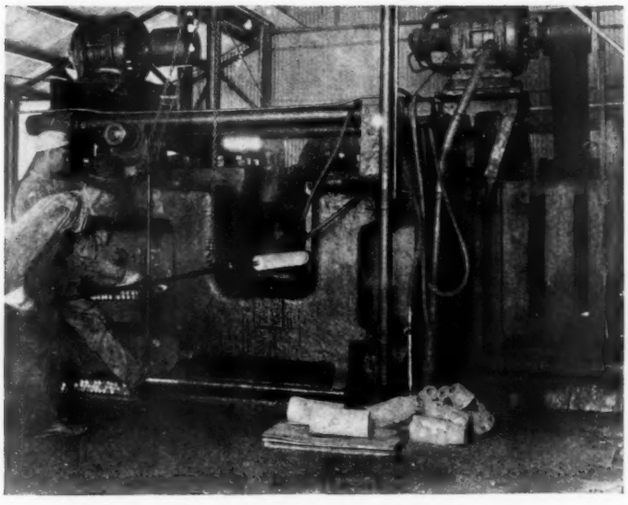
Hughes Tool Joints are made from high grade alloy steel that has been triple forged during processing.

Hughes Tool Joints are guaranteed to be interchangeable.



Hughes Tool Joints are given a careful heat treatment in furnaces controlled by recording pyrometers. This heat treatment brings out the latent properties of the alloy steel and insures great strength and toughness with maximum resistance to abrasion, fatigue and galling.

When you buy Hughes Tool Joints you buy SUPERIOR PERFORMANCE



2,030 Men—
More Than 7 Acres Floor Space
—Back of Hughes Service

HOUSTON PLANT

Divisions	No. Men Employed	Floor Space
Rock Bit Dept.	641	28,800
Tool Joint Dept.	178	21,600
Drilling & Refining Valve Dept.	126	66,400
Foundry	144	40,400
Forge Shop	64	12,600
Heat Treating Department	77	15,360
	1,230	185,160
Other Departments	639	106,120
Total	1,869	291,280
Oklahoma City Plant	54	10,000
Los Angeles Plant	107	20,000
Grand Total	2,030	321,280

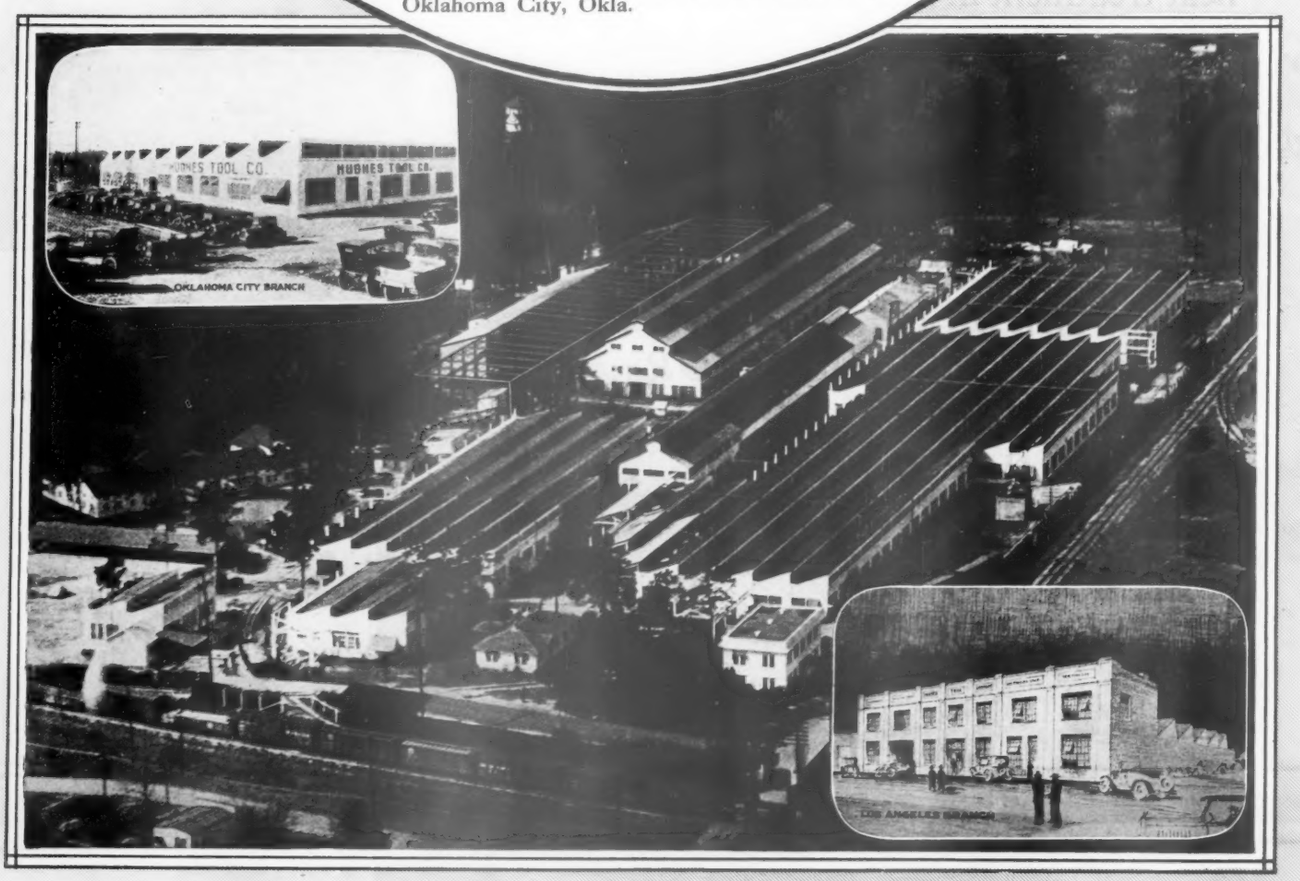
Over 7 acres of floor space.

HUGHES TOOL COMPANY

Main Office and Plant
HOUSTON, TEXAS

Branch Plants
Los Angeles, Calif.
Oklahoma City, Okla.

Export Office
New York City, N. Y.



Oil Industry Must Have Moratorium

Relief From Mandate of Sherman Law Compelling Overcompetition Needed to Curb Overproduction and Conserve Oil

By L. Vernon Gibbs, B.S., LL.B.
Professor of Oil and Gas Law, Southwestern University, Los Angeles, Calif.

The petroleum industry will be able to establish conservation of oil in compliance with the advice of the Federal Oil Conservation Board when the board can lawfully relieve the industry, during periods of oversupply, from the mandate of the Sherman Law which requires unrestricted competition. The operating companies can then lawfully co-operate in effecting restriction of production from leased lands proratably without danger of forfeiture by judicial cancellation for failure to bring in maximum production.

There are men in high position who declare that Federal control or operation is the only road to conservation; but government control or operation under any bureaucratic system will not save depletion of the nation's oil reserves or effect conservation—on the contrary, it would result in industrial stagnation, and exhaustion, without getting ready for the transition to the refining of oil from soft coals and oil shales. The only attempt of Congress to aid in perfecting a process for refining oil from shale is now rusting away in idleness on the western Colorado plateau owing to the failure of congressional appropriation. It is more important for the industry to meet exhaustion of crude oil from wells with crude oil from shale and soft coal than it is important to save the loss of a few barrels of crude oil.

Result of Adverse Conditions

The present oversupply is the result of adverse conditions converging at this time and forcing the industry into overcompetition and overproduction, but the resultant physical waste of oil has been exaggerated until the rabid discussion amounts to mild hysteria.

Oversupply of raw material is a relative condition in oil production—the same as in any other business dealing with the extraction and depletion of minerals of unknown quantity. The nation is slowly approaching exhaustion of the supply of copper, lead, iron and zinc, and there can be no changing over of these industries to an allied mineral in the same family; hence the oil industry is in a better position than the other minerals industries, for the tremendous supply of oil shale and soft coals from which crude oil can be extracted will last for thousands of years.

However, the copper, the lead, the iron and the zinc industries, because of their ability to balance supply and demand, are temporarily in a better position, for the control of the rate of production lies entirely within their management. The oil industry is prevented from exercising control over its raw products because of the nature of crude petroleum as now produced, because of the terms of and the judicial interpretations of the oil and gas lease, and because of the Federal prohibition against agreements to control the rate of production under the terms of the Sherman Law.

There are few men within the industry fully cognizant with the legal conditions affecting control of production in its relation to the present oversupply of crude oil. It is not, then, unusual to find that the officials of the Government, who are charged with aiding and advising the industry, are also in the fog, and that the general public does not understand the true position of the industry in its relation to conservation and overproduction.

Governmental Interference

It is generally known that there is an oil field called greater Seminole, producing nearly half a million barrels of oil daily, and that there are other fields scattered from California to West Virginia, and from Louisiana to Montana producing daily 2,000,000 additional barrels, but few understand the true relationship between the petroleum industry and the Government in respect to overproduction and conservation, with the realization that the present economic waste of money and oil is directly traceable to governmental intereference because of the provisions of the Sherman Law and because of the judicial interpretations of the oil and gas lease, which give control of the rate of production to the land owner and royalty holder.

The proposed plan of unit pool production by Federal operation is so obviously unconstitutional it does not merit consideration. Congress has no delegated power to regulate the use a citizen of California or Oklahoma may make of his private property unless the property enters interstate or foreign commerce. The police power in all other instances is reserved by the constitution to the states. There are small oil producing fields, with many landowners, where the oil does not leave the state where it is produced. In such instances, certainly, regulation by congress would be unconstitutional.

There are certain obstacles to conservation which fall into two general groups—the natural barriers, arising out of human nature and the physical nature of oil; and the artificial barriers arising out of the terms of and the interpretations placed upon the oil and gas lease which force unlimited production, and out of the restraints contained in the Sherman Law which prevent co-operation and which place control of the rate of production beyond the power of the producers.

Landowner Control

We are dealing with the production of an exceptional commodity different from any other mineral, under conditions unknown to the other minerals industries. Ordinary laws of supply and demand cannot regulate the production of oil. Unless the supply of oil is artificially controlled by the operators, waste and loss is the certain result.

The inelastic clauses of the lease, and the many implied covenants taked thereon by the judiciary, prevent any appreciable curtailment of drilling or production under penalty of forfeiture of the contract with the landowner, as the following judicial comment indicates:

"In the construction of oil and gas leases, different rules obtain from those applied to the construction of ordinary leases, or other mining leases owing to the peculiar nature of the mineral and danger of loss to the owner from drainage by surrounding wells. The general rule is that oil and gas leases are construed most strongly in favor of the lessor."

"Oil and gas leases are construed strongly against the lessee and in favor of the lessor, and where the terms will permit under the rules of law, said lease will be construed so as to promote development and prevent delay."

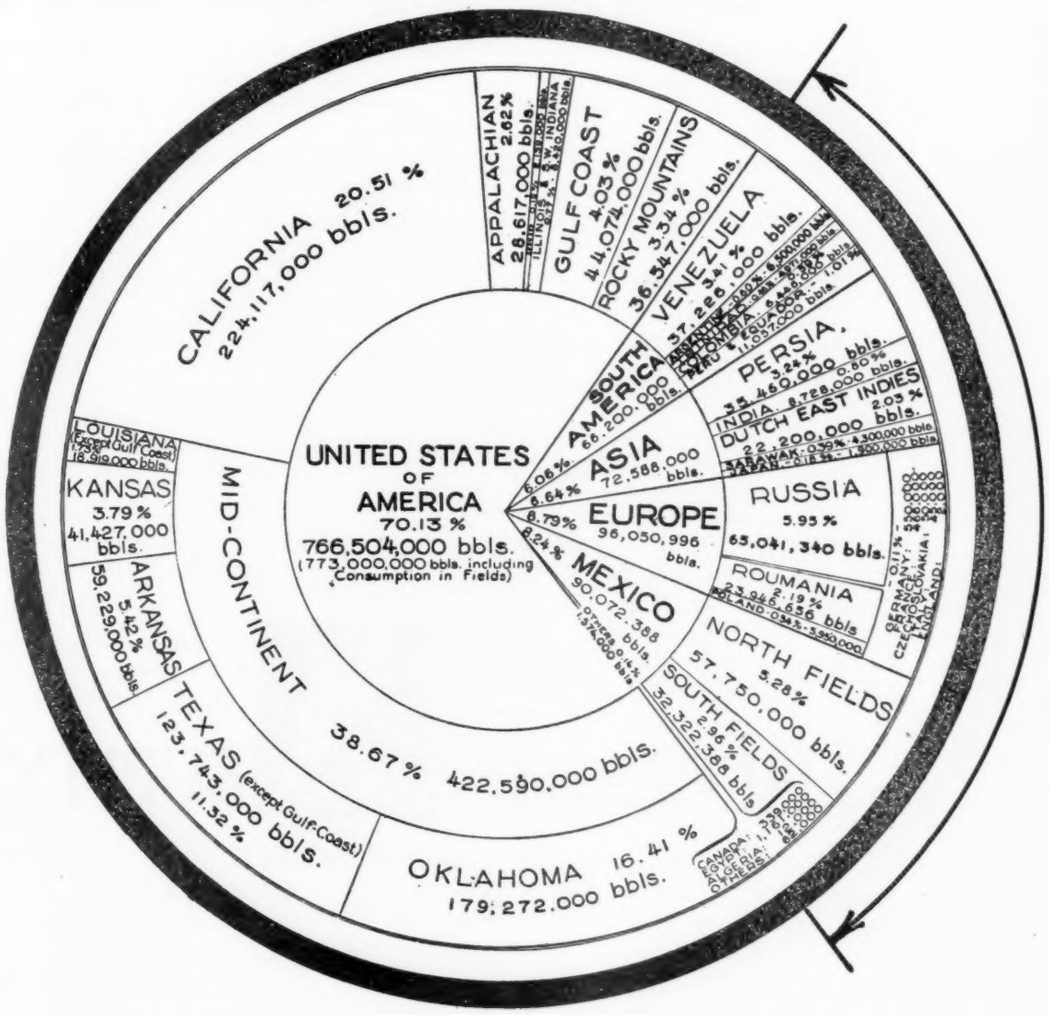
"When the lessee commences explorations, there is an implied covenant that he will diligently prosecute the search, and if oil or gas is found in paying quantities, that he will protect the lines and will develop the territory."

Insurmountable Barriers

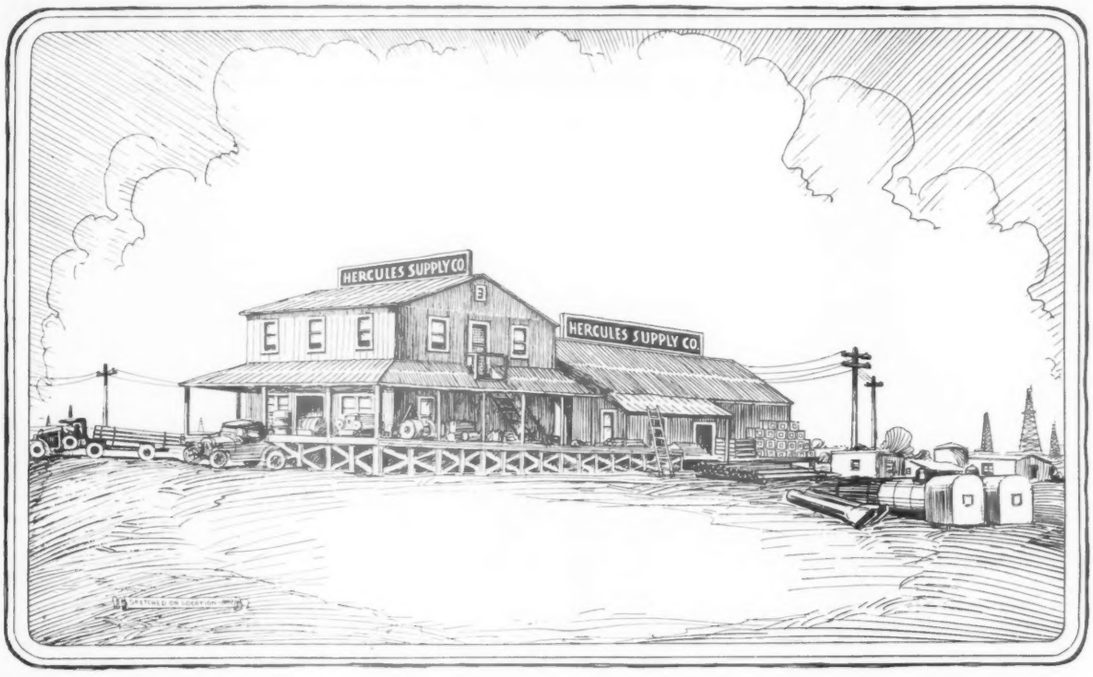
The efforts of the courts and officials to create a bulwark of safety around the landowner's rights have gone so far as to place his demands entirely beyond their proper bounds. The oil companies, with billions of dollars invested, are interested in and determined to effect conservation; but the landowner and the royalty holder, who want their royalties now, are, with the aid of the Sherman Law, insurmount-

(Continued on Page 210)

WORLD'S PETROLEUM PRODUCTION IN 1926


CALIFORNIA 20.51 % 224,117,000 bbls.
APPALACHIAN 2.62% 28,617,000 bbls.
GULF COAST 4.03 % 44,074,000 bbls.
ROCKY MOUNTAINS 3.34 % 36,547,000 bbls.
VENEZUELA 3.41 % 37,266,000 bbls.
SOUTH AMERICA 6.06 % 66,200,000 bbls.
PERSIA 3.24 % 35,460,000 bbls.
INDIA 0.80 % 8,728,000 bbls.
DUTCH EAST INDIES 2.03 % 22,200,000 bbls.
ASIA 6.64 % 72,568,000 bbls.
EUROPE 8.79 % 96,050,996 bbls.
RUSSIA 5.95 % 65,041,340 bbls.
ROUMANIA 2.19 % 23,936,636 bbls.
MEXICO 8.24 % 90,072,388 bbls.
NORTH FIELDS 5.28 % 57,750,000 bbls.
SOUTH FIELDS 2.96 % 32,322,388 bbls.
UNITED STATES OF AMERICA 70.13 % 766,504,000 bbls. (773,000,000 bbls. including Consumption in Fields)
MID-CONTINENT 38.67 % 422,590,000 bbls.
TEXAS (except Gulf Coast) 123,743,000 bbls. 11.32 %
OKLAHOMA 16.41 % 179,272,000 bbls.
ARKANSAS 5.42 % 59,229,000 bbls.
KANSAS 3.79 % 41,427,000 bbls.
LOUISIANA (except Gulf Coast) 18,919,000 bbls.

Total 1,092,989,384 bbls. of which the United States provided 766,504,000 bbls. or 70 per cent.



There Are Ten Thousand Chances That You Can Get It at the Hercules Store in Wink

RIGHT in the heart of the Winkler field, in the best and most convenient location in Wink, the Hercules Supply Company has established a complete oil field supply store. This store is twenty miles from the railroad at Pyote, over some of the worst sandy roads in West Texas.

Fully stocked, this store carries for immediate use over ten thousand different items ranging from cotter pins to oil field boilers.

Complete Lucey rigs on the floor. Then there are

American Steel & Wire Co. Wire Lines
"D. & B" Sucker Rods, Working Barrels and Pumping Specialties, Hooks, Sockets, Stuffing Boxes, etc.
American Cordage (Trojan), Bull Ropes, Cat Lines
O. I. W. Cable Tools (Heat treated and guaranteed)
"Yale" Chain Hoists
Worthington Pumps and Machinery
Westinghouse Generators
Burt Swabs
"Hercules Special" Belts, rubber covered and friction surface
Bovaird Spiders and Elevators
Goodrich-Hi-Flex, Commander Belting and Packings
Crane Valves, Fittings and Special Refinery Equipment
Kennedy Valves, Fittings, Fire Hydrants
Powell Valves and Steam Specialties
Hough Pumping Equipment, Steelex, Bronzex Balls and Seats
No-Co-Ro Balls and Seats
Guiberson Tubing Catchers, Swabs, Oil Savers, etc.
O'Bannon Pumping Equipment and Specialties
"Etna" Casing, Line Pipe, Tubing (Spang, Chalfant)
Pittsburgh Seamless Tubular Goods
"Hercules" Casing Shoes
Neilson Pumping Specialties
Wilson Tubing Elevators, Tongs, etc.
Dunn Tubing Elevators, Tongs, etc.
Darcova, Lubri, D. & B., etc., Valve Cups
Perfection Core Barrels
Spang Jars
Wilson Rotary and Casing Elevators, Tongs
Dunn Rotary and Casing Elevators, Tongs
Penberthy and Chicago Injectors
Lufkin Tapes and Rules
Fishing Tools, both Rotary and Cable
"Beaver," "Nye" and "Toledo" Stocks, Dies, Pipe Cutters
Vulcan and Billings Spencer Chain Tongs and Wrenches
Disstons and Atkins—Saws, Hardware

The same efficient service will be given at Pyote as given at Hercules stores on similar locations, such as Borger and Mildred.

American Wire Lines
Lucey Rotary Products

Etna Tubular Products
Pittsburgh Seamless Tubular Goods

HERCULES SUPPLY CO.

J. T. McCARTHY JR

Everything For Oil Wells

GENERAL OFFICES-DALLAS

BORGER VERNON WORTHAM PYOTE (WINK)

How Gasoline and Kerosene Are Made

Our 23,000,000 Drivers of Motor Vehicles Told How Major Refined Products Are Obtained from Crude Oil

By C. O. Willson

In telling the story of petroleum refining to the Jones family the writer cannot hope to equal in simplicity the ingenious traveling man who explained the art as he sat in a Pullman smoker. Pointing to a large crude oil storage tank visible from the Pullman window he told fellow passengers that all the refining took place within the tank.

According to his explanation the crude oil was pumped into the tank from the wells and allowed to settle. Gradually, he explained, the gasoline came to the top of the tank in the same manner apparently that cream comes to the top of a milk can. Just below the gasoline was the kerosene, with the fuel oil settling to the bottom.

What this explanation lacked in accuracy was offset by its brevity. Fortunately perhaps for the explainer none of his hearers asked him regarding the manufacture of lubricating oils, gas oils, furnace oil distillate, wax and the hundred and one special products which are obtained from crude oil.

The manufacture of gasoline and other refined products is more than a settling operation for otherwise it obviously would not have been necessary to invest approximately $3,000,000,000 in that phase of the oil business. However, the general principles involved in making the products are not difficult to understand.

The writer has asked the Jones family to go to the kitchen of their home where he will endeavor to explain the essential features of refinery operations around the tea kettle on the stove. This kettle has had a fire under it long enough so that steam is coming from the spout.

Changing Water to Steam

All the members of the Jones family know what is taking place in the kettle. The fire has heated the water to the boiling temperature. This means that the water is gradually being changed into steam vapor which comes out the spout. If the fire is left under the kettle long enough all the water will be changed into steam, as every housewife knows, and the kettle will be dry.

The Jones family is also familiar with the fact that holding any cold object in the path of the steam as it comes from the spout will cause a part of the steam to condense and become water again. If a pipe is connected to the spout and the pipe in the form of a coil is submerged in the cold water all of the steam will be condensed into water again.

This method of changing the water into steam and then condensing the steam into water again is generally termed a distillation operation. The term "distillation" is applied to any operation in which a liquid is changed into a vapor and then condensed by cooling.

Distillation Apparatus

A distillation process is the operation through which crude oil is changed into gasoline, kerosene and other products. To show how this is done the tea kettle on the Jones' stove will be replaced with a steel barrel. Instead of having the spout coming out the side of the barrel it will be made to extend from a cone-shaped top. This spout through which the vapors pass will be lengthened so that it connects with a coil of pipe in a tub or boiler filled with cold water. The accompanying diagram shows this arrangement when it is completed.

Mr. Jones has just remarked that this apparatus very much resembles his neighbor's equipment for making corn liquor. Mr. Jones is right for there are many "moonshine" installations which could make a product similar to gasoline with the proper grade of raw material. This experiment is not recommended for the gasoline made would probably rate even lower in quality than the average home-made liquor. It should be stated here, however, that the refining industry has taken many of its more complicated methods of manufacture from the alcohol industries. The term "still," referring to the container in which the distillation takes place, is common to both industries.

The next procedure in the Jones kitchen will be to fill the steel barrel which we will now call the still, with 42 gallons (one barrel) of crude oil. There are many types and grades of crude oil which could be used. For this operation we are going to fill the still with an average grade which is found in many of the fields. This particular grade, known as "36 gravity," weighs about 7 pounds to the gallon. This is lighter than water, as are most crudes, water weighing about 8⅓ pounds per gallon.

With the still full of crude oil the fire can be lighted. For the purpose of keeping a check on the temperature of the crude oil a thermometer will be inserted in the liquid. This is a Fahrenheit thermometer of the same type as the one which shows that the temperature on a hot day is around 100 degrees or below zero on a winter day.

Making Gasoline

When the thermometer in the still shows that the temperature is 200 degrees it will be noted that a little liquid is coming from the condenser. This is the start of the gasoline from the crude oil.

At this point the difference between crude oil and water should be pointed out. In the case of water the liquid boils at a temperature of 212 degrees. It is impossible to raise the temperature above that point as long as the steam is allowed to come off the water freely. If more fire is placed under the tea kettle it simply means that the steam will come out of the spout faster, the temperature of the water remaining the same. By maintaining this temperature of 212 degrees all the water eventually will be changed into steam and the kettle will be dry.

The situation in the case of crude oil is slightly different. Crude oil is not as uniform a liquid as water from the standpoint of boiling range. A barrel of crude oil is like a bushel of mixed grains of different sizes. Run this bushel through a series of sieves and you will separate them according to sizes. The corn will be in one pile, the wheat in another and oats in still another.

So it is in distilling a barrel of crude. The gasoline in the crude, which is the lightest fraction, is distilled off first, then the kerosene followed by the distillate and gas oil. Finally there is left in the bottom of the still that fraction of the crude which is not distilled, commonly known as fuel oil.

All the gasoline does not distill off at the same temperature. This first gasoline is very light and would not be suitable to use in an automobile. Throw a bucket of it on the floor and it will completely evaporate in a few minutes. If the temperature in the still were maintained at 200 degrees a small amount of this very light gasoline would be distilled off the crude oil and then the flow from the condenser coil would stop. This is due to the fact as previously explained that crude oil is made up of particles all of which vaporize at different temperatures.

However, the practice is gradually to increase the temperature of the still and this results in all of the gasoline being distilled out of the crude oil. The temperature in the still when the last gasoline is distilled off would be around 400 degrees. All of this would probably be emptied into one tank. It then would be a blend of all the gasoline obtained from the crude oil. It has been found that this blended gasoline gives satisfactory operation in all automobiles. The first gasoline that is distilled off is too light and the last fractions would be too heavy, but the mixture of the two gives the desired gasoline.

How Kerosene Is Made

The next product obtained is kerosene. It is derived in the same manner as the gasoline, the only difference being that it is necessary further to increase the temperature of the crude oil in the still. While the kerosene is being distilled out of the crude oil the temperature of the latter is gradually increased from 400 to 475 degrees.

Next we distill off a small amount of distillate. This distillate is sometimes used in place of kerosene, but the greater part is utilized as fuel for heating homes, apartment houses and other buildings. In distilling off this distillate the temperature of the crude oil in the still will be increased from 475 to 500 degrees.

Finally we will increase the temperature from 500 to 575 degrees and distill off what is known as gas oil. This product is widely used by companies manufacturing artificial gas from coal. The gas oil is vaporized and mixed with the artificial gas to make a better fuel.

After we have distilled off all the gas oil which will vaporize at a maximum temperature of 575 degrees the fire is turned out and the still allowed to cool. There remains in the bottom of the still about 36 per cent of the original crude oil. This remainder is pumped out of the still and sold as fuel oil to railroads, steamships and many industries where it is used in place of coal.

Products Obtained

From the original 42 gallons of crude oil we have obtained the following products: 35 per cent gasoline (14.7 gallons); 8 per cent kerosene (3.3 gallons); 4 per cent distillate (1.7 gallons), and 15 per cent gas oil (6.3 gallons). We have left in the bottom of the still 36 per cent fuel oil (15.1 gallons). From 1 to 2 per cent would be lost in the operation, due largely to the evaporation losses in the gasoline. The division of products is shown in the accompanying diagram.

If it is considered desirable the temperature of the crude oil in the still can be increased above the 575 degrees and more gas oil will be distilled out of the crude oil. In fact the temperature can be increased to 700 or more degrees until nothing is left in the bottom of the still but coke. This coke is similar to coal and is used as fuel in the same manner. This would mean that a greater percentage of gas oil would be distilled. This gas oil, however, would not be as desirable for most uses as when a smaller percentage is distilled from the crude oil.

Treating the Gasoline

We now have what we have called gasoline and kerosene. However, neither product is yet ready for the market. Practically all crude oils contain impurities, the most important of which is sulphur. Unfortunately this sulphur is not only present in the form of yellow powder commonly called flower of sulphur with which everybody is familiar, but is present in the gasoline and kerosene as intricate compounds which are not visible to the eye. They must be removed or the gasoline will corrode certain parts of the automobile engine and the kerosene will not burn properly in the lamp or stove.

There are various methods of removing the sulphur from the gasoline and kerosene. One common method is to thoroughly mix a small amount of sulphuric acid with the gasoline or kerosene. Then it is necessary to treat the gasoline and kerosene with caustic soda solution, which will remove what sulphuric acid remains. Finally the gasoline and kerosene are washed with water to remove the caustic solution. This so-called "treating" process must be carried out very carefully to assure satisfactory results.

One of the Jones boys says he has heard something about this "cracked gasoline" and he wants to know how it is made. This is a relatively new type of gasoline involving more complicated methods of processing although the oper-

TELLING THE JONES FAMILY

John Jones accompanied by Mrs. Jones and their four children drove the family Ford into the corner filling station. Mr. Jones continued to rest behind the steering wheel while one attendant filled his gasoline tank, another measured his oil and put in the required amount while a third tested his tires, filled his radiator with water and wiped the dust from the windshield.

A few seconds later, Mr. Jones had obtained 10 gallons of gasoline and 1 quart of lubricating oil which would be sufficient to keep the car running 150 to 200 miles during the coming week. In that next week the car would be used daily to take the children to and from the town school, their parents would get in two or three trips to town, the entire family would attend church services on Sunday morning and in the afternoon they would take a long trip to visit relatives in an adjoining county. If any of the family should want to make any special trips during the week the car would perform this service.

In addition a 5-gallon can of kerosene was purchased. This kerosene would furnish all the oil needed for lamps in the house, keep the incubator at an even temperature during the week and supply all oil needed for the kerosene stove in the kitchen.

The filling station's total charge was $3. Of this amount 30 cents would be turned over to the state as a 3-cent gasoline tax to help build the hard-surface highways similar to that over which the Jones family had just driven to town.

"I wonder how they make that gasoline, kerosene and oil," Mrs. Jones was heard to remark as they drove the car out of the station. "They are cheaper now than they used to be and everything else we buy costs more." Mrs. Jones had in mind the groceries and some clothing which she had just purchased.

The writer, in this article, accompanies the Jones family back to their home and tells them how the products which play such an important part in their week's enjoyment are made and then explains briefly why they are "so cheap."

ation is based on distillation as was the other.

In making the gasoline and other products from crude oil no chemical action was involved. That is to say the products were simply separated out of the crude oil. This gasoline, kerosene, distillate, gas oil and fuel oil could be thrown back into the barrel and the mixture stirred up and you would have the original crude oil minus a small evaporation loss. The process is like dividing an apple into several parts. The parts can be put back together and you have a whole apple again. But in making cracked gasoline the situation is somewhat different. The apple, so to speak, becomes applesauce.

The cracked gasoline is made by taking the gas oil or fuel oil and placing it in a still of special design to withstand high pressures. The operation is controlled so that the distillation (i. e. changing the liquid into vapor) takes place at pressures which are as high as 500 pounds and at temperatures which vary from 750 to 1,200 degrees. At these high temperatures and pressures a chemical decomposition or "cracking" of the gas oil or fuel oil takes place. The character of the oil in the still is changed so that it is similar to the original crude oil containing gasoline, kerosene and the other products.

This cracked gasoline looks like any other gasoline and is practically the same in every respect. Recently it has been discovered that cracked gasoline has certain characteristics which make it very desirable for use in an automobile. For instance the engine is less likely to "knock" than it is with the ordinary type gasoline commonly called "straightrun" gasoline. Most gasolines sold contain both the cracked and straightrun gasolines.

Natural Gasoline

Another one of the Jones boys says he has heard of a gasoline called "natural gasoline."

There are over 300,000 producing oil wells in the United States. Whether the crude oil is flowing naturally or is obtained by pumping, gas is obtained along with the oil from a majority of the wells. Up until about 15 years ago this gas was wasted. It was allowed to escape into the atmosphere.

It was discovered that the gas contained a small quantity of gasoline. For instance if a room 10 feet square and 10 feet high was filled with this gas it would be said to contain 1,000 feet. This gas, although it would not be visible to the eye, would contain gasoline. The amount of gasoline would vary, in some cases being only a fraction of a gallon per 1,000 cubic feet and in other cases as high as 8 or 10 gallons.

Extracting Natural Gasoline

Now the gasoline manufacturer has devised means to extract the gasoline from this gas commonly called "wet" gas to distinguish it from "dry" gas obtained from gas wells which in most cases does not contain any gasoline.

One method of extracting the gasoline is compressing the gas. If it were possible to apply pressure to that roomful of gas just mentioned you could compress or literally "squeeze" the gasoline out of the gas. This is actually done by large compressors. The gas is compressed to around 300 pounds in cylinders similar to those in an automobile engine. At the high pressure the gas is run through condensers, cooling the gas and condensing out the gasoline.

Another method of extracting the gasoline is to bring the gas in contact with a refined oil. The distillate obtained in the original distillation operation might be used. When this distillate comes in contact with the gas it absorbs out the gasoline. Then by placing the distillate in a still the gasoline is distilled out and recovered as gasoline. A combination of the compression and absorption is the method most commonly used.

This natural gasoline is usually even lighter than the lightest gasoline obtained by distilling crude oil. It is not suitable for automobiles although it is now quite widely used by airplanes. The practice is to blend it with the so-called straightrun and cracked gasolines previously mentioned and it is then adaptable for use in any type of internal combustion engine.

About 1,000,000,000 gallons or better than 10 per cent of the total gasoline made this year will be natural gasoline.

Lubricating Oils—Wax

The manufacture of lubricating oils is a more difficult proposition than the making of gasoline and other products. The Jones family is familiar with the three main grades sold at filling stations —heavy, medium and light. They were not aware that there are many different types for each of these grades. In addition, outside the automobile industries, there are numerous special lubricating oils which are demanded by all the other industries. Many of these lubricating oils are only obtainable from certain grades of crude oil.

It is not possible here to describe how all these oils are made. Only a few general principles will be explained. The lubricating oils in the barrel of crude oil on which this discussion is based will all be found in the 15.1 gallons of fuel oil which was left in the bottom of the still after the other products had been distilled off.

Looking at that black fuel oil and comparing it with the sparkling lubricating oils in the containers at the filling station it is apparent that there is a great difference between the two.

We will first make what we will term a light oil. To do this it will be necessary to heat the fuel oil to a high temperature so that we can distill off a product which is called wax distillate. This wax distillate contains some lubricating oil, wax and the rest a distillate. This wax has to be separated from the lubricating oil because it has no value as a lubricant and will cause the oil to congeal in cold weather.

If this wax distillate is poured on a cake of ice it will be noted that the wax becomes a semisolid and sticks to the ice. This fact is the basis for the method of extracting the wax from the distillate. The distillate is cooled to a low temperature and then pumped into wax presses. The wax stays in the presses and the distillate is removed free of that material.

After that operation the wax free distillate is redistilled. Then it is treated with sulphuric acid to remove the impurities. Finally it is percolated through what is called fuller's earth to remove any remaining impurities and also to give it the color which makes it a marketable product.

Heavy Oils

The fuel oil which is left in the still after the wax distillate is removed also contains the heavy lubricating oils. The problem here is to separate this desirable lubricating oil from the asphalt wax, sulphur and other impurities. This is done in part by treating the fuel oil with sulphuric acid and other chemicals. One phase of this operation provides for running the oil through centrifuge machines. These machines operate on the same principle as a cream separator in which the cream is removed from the milk. In this manner the lubricating oil is separated from the amorphous wax.

The wax which Mrs. Jones uses during the canning season is made from the wax which was pressed out of the wax distillate. Before it is suitable for use, by Mrs. Jones, however, it is further refined and all the impurities removed. This is done in a "sweating" operation.

Why It Is Cheap

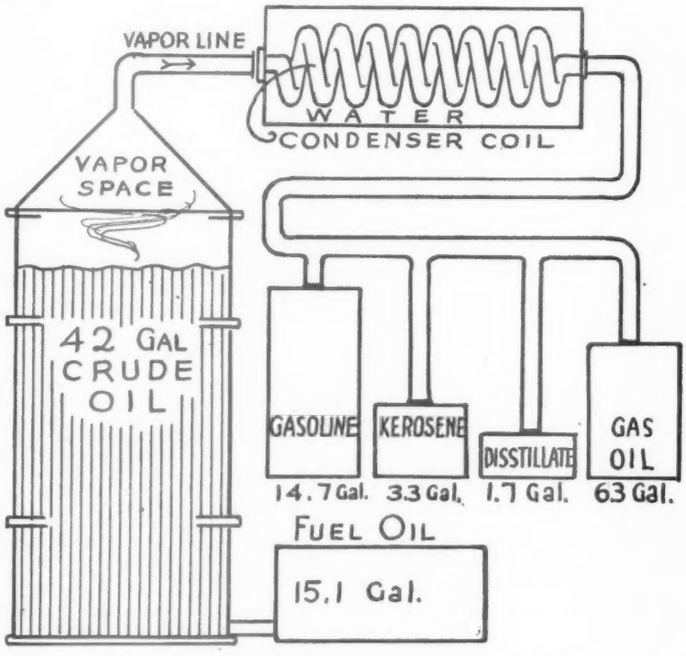
The writer has endeavored to explain how the principal refined products could be obtained from crude oil. The apparatus used approximates the old "batch" method of refining long since obsolete at a majority of refineries. It is fortunate for the Jones family and the owners of the 23,000,000 automobiles, trucks and other motor vehicles now in use that refining methods have greatly changed. Otherwise Mrs. Jones would not have made the statement regarding the cheapness of the gasoline, kerosene and lubricating oil.

The situation in regard to refining is similar to the problem of assembling the Ford automobile. If Mr. Jones had all the parts that go into a Ford automobile and plenty of time he could conceivably assemble the car. But the low price of the Ford is largely due to the fact that labor saving machinery and methods have been devised at the Ford factory with which to manufacture and assemble the parts at a minimum cost.

So it is in refining. New types of furnaces, pipe stills, intricate fractionating equipment, all kinds of heat exchangers and other mechanical perfections have made it possible for the refiners to pass on to the consumers large saving in manufacturing costs. The cracked gasoline and natural gasoline have made it possible to obtain approximately twice as much gasoline from crude oil as was secured 15 years ago. This fact has probably averted a serious shortage of gasoline at this time and largely accounts for its cheapness.

PAST PROPHECY OF FAMINE

In 1914, Ralph Arnold made a survey of the country's future oil wealth, according to which the fields in Kansas, Kentucky, Tennessee, Louisiana, and Texas should now be "exhausted."



Simplified apparatus for distillation of refined products from crude oil.

British Oil Chief Describes Effects Of Overproduction

By Sir John Cadman, K.C.M.G.
Chairman of the Anglo-Persian Oil Co., Ltd.

Overproduction for a time may mean very cheap products for the consumer. It means also industrial disorganization, the elimination of many of the smaller units in the industry and dissipation of one of the world's most precious assets.

I am not among those who claim that the world's resources of petroleum are on the eve of exhaustion; it would, however, be foolish to imagine they are illimitable. In my opinion very many years must elapse before natural petroleum's resources will be unable to meet the greater part of the world's requirements. Of course the time will eventually come when the world may have to look for a great part of its supplies from secondary and synthetic sources, but he would indeed be optimist who imagined that on the reaching of such a stage prices would remain as low as those existing in the past.

Nowhere is this better realized than in the United States. How to conserve that country's oil reserves without stinting the present generation is, perhaps, the greatest and most complicated economic problem the United States authorities have ever been called upon to face. Consumers everywhere would suffer from high prices if the American demand should ever much exceed the American supply. A wise and considered policy of conservation, such as the best heads in America are now seeking to devise, whilst primarily in the interests of America herself, must therefore be also of ultimate benefit to all countries.

I would like to point out that, in some respects, the Persian oil industry enjoys a position which the Federal Conservation Board would like to give the American oil industry as a whole. Our royalty holders speak with one voice. The interests of those royalty holders are those of the industry itself; clearly it is in the interest of Persia as it is of this company that production should be steadily controlled—that is to say, steadily regulated in conformity with the world's demands; that the reserves of oil underground should not be extravagantly and uneconomically forced to the surface, regardless of the world's requirements. Fortunately we are not compelled to overproduce, which is often the case elsewhere—owing to the feverish rivalry of offsetting competitors.

There is, however, one phase of the situation from which we may derive encouragement and confidence, and that is the steady and remarkable growth of the consumption of petroleum products in every part of the world. If the production of petroleum is far greater than ever before in the history of the industry, so also is the consumption.

Further I might also mention that the improved yields and the economies we are constantly striving to introduce into all phases of our operations represent an important, if only a partial, offset against the effect of overproduction and uneconomic prices.

FUTURE OIL QUESTION OF COST

Today we are producing about 2,000,000 bbls. of crude oil daily and with the present scientific methods of determining possible producing areas, the future production of crude oil appears to be largely limited by its cost of production and by a cost that will permit its delivery to the public in competition with known substitutes that have been developed, and are being developed, which will take the place of petroleum oil products "when their cost of production and manufacture is sufficient to permit this completion."
—J. Edgar Pew.

OBSTACLES SHOULD BE REMOVED

Political action is superficially attractive, but it is beset with difficulties and it is not likely to succeed. Something might be accomplished by the removal of legal obstacles to intelligent co-operation.
—Former Justice Charles E. Hughes.

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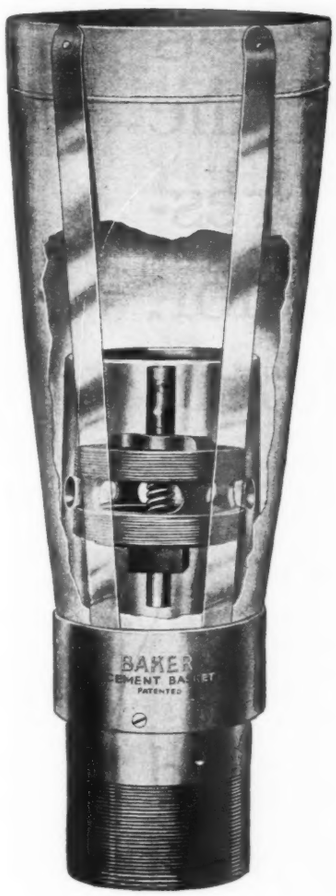

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"In conservation, as I see it, there is no hazarding the future safety of the nation for any mere present day advantage, nor, on the other hand, should we suffer any utter sacrifice of the present in favor of the future.

"There can be and should be a rational balancing of present and future advantages.

"In all respects conservation makes its appeal to reason and is a policy that should win the support of men of affairs. It is a practical policy in the nation's business."

Extract from the speech of Hon. Hubert Work Secretary of the Interior and Chairman of the Federal Oil Conservation Board, before the Mineral Law Section, American Bar Association, at Buffalo, August 30, 1927

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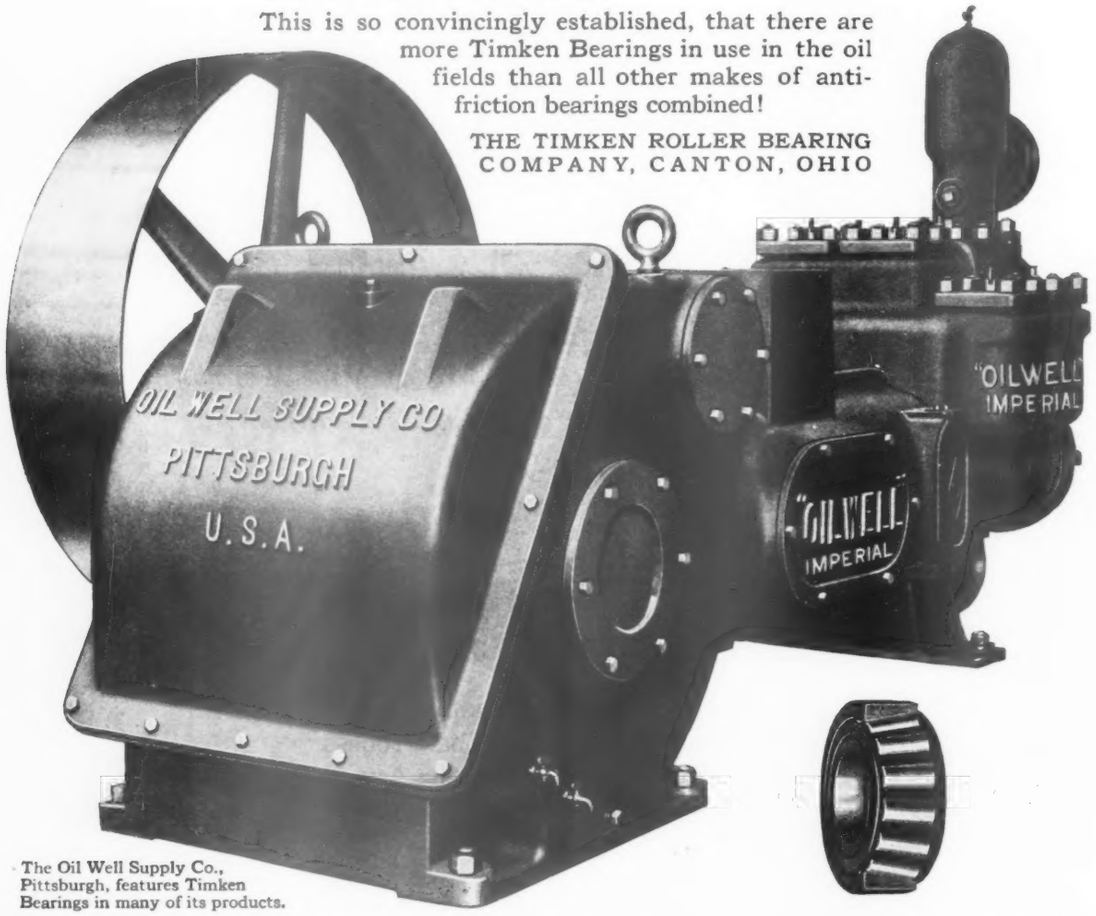

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Cost of Refining Barrel of Crude Oil

Many Varying Factors to Consider in Arriving at Representative Figure. Data on Average Plant Given

By W. T. Ziegenhain

To picture an "average" refinery and work out costs that would apply to the "average" refinery means that many factors must be considered due to the difference in the geographic location of the refining centers, the nearness of the crude supply, the size of the plants, the variations in the kind and quality of the crudes, and the extent of the refinement.

These factors vary the manufacturing costs and these are often referred to as the "refining cost" but they are but a small part of the "actual" cost of refining. While it is impossible to say exactly what the average cost of refining a barrel of crude is, it is not difficult to determine the relation between the various costs and set up a fair index of the average cost.

The skimming cost, that is, reducing a barrel of crude oil into its natural components such as gasoline, kerosene, gas oil and fuel oil as is being done in many plants even yet, may be carried out as low as 12 cents a barrel considering the manufacturing cost only. The manufacturing cost on the same barrel of oil processed to make lubricants and a maximum yield of gasoline by cracking will run nearer to 50 cents a barrel.

Changes in Equipment

But the manufacturing expense is not the major cost to the refiner. His investment determines what these other costs shall be. Part of this investment is in the equipment he is using, and part of it is in obsolete equipment. Changes in refining have come so fast over the past five years that it is difficult to say what proportion may fall in the respective classes but this is of no concern in figuring costs on the investment. In calculating the various costs a figure of 87 cents per barrel was arrived at, as the total average cost of refining a barrel of crude oil in the United States and of this amount 28 cents is the manufacturing cost, 15 cents the cost of piping the crude to the refinery, 11 cents the sales cost and 33 cents for the indirect or "invisible" costs as obsolescence, depreciation, taxes, insurance, interest and overhead. Of this latter amount, obsolescence and depreciation amounts to 14 cents, interest, insurance and taxes 17 cents and general office overhead 2 cents.

A complete refining unit must have these departments and a complete unit is the most economical so this is typical of the industry and where certain of these costs do not exist there is a counter balancing loss of revenue, except in the case of a very few small plants who limit their operations to supplying a very small community and have a local advantage in being near a crude supply. These plants would not amount to 1 per cent of the total on the basis of the amount of oil refined and might be ignored in a general discussion except that such conditions exist and serve as one of the factors to be misleading in the understanding of the general situation.

Average Plant

As a basis for these costs, the "average" plant was pictured as producing the various classes of oils and in proportion to the yields shown by the government reports for 1926 so far as practically possible. The total refining capacity in the United States is known to be about 3,224,300 bbls. daily and the total operating capacity to be near 2,964,400 bbls. a day. There are 328 operating refineries making the average runs at each of these approximately 8,000 bbls. a day. During the operation of this 8,000-bbl. plant, 2,720 bbls. of gasoline is made daily, 800 bbls. of which is cracked gasoline. This gives an index of the amount of cracking euqipment needed. Approximately 320 bbls. of lubricants are manufactured daily including all grades and the amount of equipment needed was based on this figure. The detailed summary of yields may be seen under Table 1.

TABLE 1
Average Yields in 8,000-Bbl. Plant in the United States

	Per cent	Bbls. Daily
Gasoline	34.0	2,720
Kerosene	7.8	624
Gas oil and fuel oil	46.2	3,696
Lubricants	4.0	320
Wax, coke, asphalt and specialties	4.6	368
Loss	3.4	272
Total	100.0	8,000

Investment Division

This "average" refinery represents an investment of nearly $5,000,000, the detailed estimate as shown in Table 2 being $4,925,000.

TABLE 2
Investments in the Average 8,000-Bbl. Refinery

Skimming plant	$1,750,000
Lub plant	225,000
Asphalt plant	90,000
Cracking plant	800,000
Research and control laboratories	10,000
Tank cars	1,980,000
Office equipment, tools, etc.	70,000
Total investment	$4,925,000

It would not be necessary to make this investment in a plant doing the same work were it built today, but that condition might be applied to any progressive industry. Refiners are making changes in their equipment as quickly as possible to effect savings in operating costs and increase yields but this does not pay for the expenditures already made in equipment, subquently made obsolete. Taking the investments as they stand, the average refinery of 8,000-bbl. capacity includes about $1,750,000 for the skimming plant. This includes the stills, towers, condensers, tankage, lines power house, treating plant, loading rack, etc., incident to topping the crude oil and making suitable products to be processed further in the various departments.

There was a time when only shell stills were used and these were operated individually. Then it was found that the capacity of the combined number could be materially increased by operating them in series. This change was made and took an additional investment. Then the pipe still was found to give a still greater throughput for a given investment and effected enough of a saving in fuel, the old shell stills were either replaced or set aside.

This occasioned another addition to the investment. Better towers, furnaces, condensers, piping, tanks, treating systems, etc., all came at once and over the past five years, the added investments almost amounted to the original investment and in many cases exceeded the original investment. But the refiner who did not do these things could not compete with the one who did do them and it was a matter of making the added investment or closing down the plant. This is the cause for the constant decrease in the number of refineries in the United States and the reason why the increased capacity is in the larger units. Over the period of the past three years the total number of plants has decreased from 584, the maximum in 1925 to 462 in 1927. The number of operating plants has decreased from 385 to 328 within that time. These facts tell the story alone.

Lubricating Oil Plant

The "average" plant also makes 320 bbls. of all grades of lubricants and considering the needed investment to carry out such a program, approximately $225,-

000 would have to be invested in a wax house, stills, agitators, filter house, bone burner, lines, tankage and a compound house. Although the general methods of making lubricating oils has not varied a great deal over the past five years, there has been a decided plea for improved quality in the products and refiners have supplied ample capacity for the processing of the oils and some have invested considerable sums of money for control of the processing. Vacuum distillation equipment has been adopted by some. Bright stock plants have been added to a great many plants and considering all of these factors, the estimated average investment in the lubricating oil department of the average refinery appears conservative.

The cost of the asphalt plant in the "average" refinery has been set at $90,000 and includes the special stills, blowers, etc. It is not probable that an asphalt plant, this small, would be included with a refinery running a paraffin base crude and making the given amounts of lubricating oils and wax but in portraying the "average" plant the manufacture of all products had to be considered.

Cracking Investment Large

The investment of $800,000 in cracking equipment as estimated is considered typical of the amount already spent in producing 800 bbls. of cracked gasoline daily and represents not only the cost of the cracking equipment needed to do this work but the added tankage, distillation equipment, treaters and auxiliaries, which refiners must install in order to take advantage of the higher gasoline yields from cracking. In addition, some refiners have spent millions of dollars to develop a given process and in the course of the development of this equipment found other equipment had been so much further developed that it paid to abandon the research program outlined and start over again.

This is the cost of research, but without such sacrifices the cracking process could not have been brought to its present state of perfection and furthermore, the program of research is continuing in this field and it is generally realized that sufficient improvements in cracking will have been perfected over the next five years to render the present units obsolete. This cycle can be seen in operation now and in direct reference the recent abandonment of the many Burton old-type pressure stills by the Standard Oil Co. of Indiana and the erection of other types may be cited. Along with the replacement investments, huge sums are being spent for new installations. California has mapped out quite an expansion program in cracking and as soon as gasoline prices return to normal there will be a resumption of this development.

The research laboratory and control laboratory of the "average" refinery has been estimated to cost $10,000. One piece of equipment in many of the larger research laboratories costs several times this amount while on the other hand, some refineries do not attempt to carry on any research work and do little control work and an investment of $2,000 would be more nearly representative in that case.

Largest Single Investment

The investment in tank cars represents the greatest single investment as shown in Table 3. This may be easily accounted for, however, since the output of the average plant amounts to 1,300 cars of oil a month and requires approximately 900 tank cars to distribute these to customers within a reasonable radius of the plant. At an average cost per car of $2,200 the $1,980,000 investment is accounted for.

Necessary tools and equipment have been estimated at $70,000 and is also intended to cover the cost of incidental equipment such as fire fighting equipment, advertisements, etc. on the refinery grounds.

Large Obsolescence Factor

With these investments as a basis, the calculation of the indirect costs resolves itself to setting equitable percentage charges for each, depreciation, interest, taxes and insurance. Depreciation on the refinery varies in the different departments and when considering both obsolescence and depreciation together, this fact is made more forceful. The depreciation on the skimming plant, lub plant and asphalt plant is set at 8 per cent which means that it will either be worn out or replaced with more modern equipment at the end of 12 years. The corresponding charge on the cracking equipment is set at 20 per cent. This does not mean the equipment will deteriorate that fast but within that time sufficient developments will have been made that it would pay to discard the old equipment.

This appears as an abnormal charge and as the art of cracking is developed this will be decreased, but when all factors are considered it seems reasonable for the present. The depreciation on tank cars is, of course, much less, for these are well standardized and a charge of 5 per cent is usually taken in figuring their depreciation.

Taxes, interest and insurance are almost in proportion to the total investment and may be figured collectively. Taxes usually amount to 1.5 per cent of the total investment, interest may be taken at 7 per cent and insurance usually approximates the taxes at 1.5 per cent. With the baiss of these indirect charges explained, the total costs may be outlined and are shown below in detail. These are all made comparable by basing them on the "per barrel of crude run."

TABLE 3
Relative Refinery Costs for the Various Operations, Per Barrel of Crude Run

Operation and maintenance—	
Skimming	$ .10
Lub plant	.09
Cracking	.09
Pipe line transportation	.15
Sales cost of refined products	.11
Depreciation and obsolecence	.14
Interest, taxes and insurance	.17
Office overhead	.02
Total refinery expense	$ .87

Large Saving from Standardization

Petroleum Industry Has Made Greater Progress in Two Years Than Other Industries in Twenty

By J. Edgar Pew
Vice President, Sun Oil Co.

In analyzing the position of the oil business as it stands today, before the general public, the popular conception seems to exist that it is a wasteful industry, and one is apt to gain the impression that it has no regard for economy in any form. The word "waste" has many bad associates. It implies willful embezzlement of a highly important and natural resource—one imagines rivers of oil allowed to run freely away; that the business is essentially a gamble—easy come, easy go, etc., etc. Whereas, quite the contrary is true. So far as I know, no crude petroleum produced in this country is allowed to go to waste, but it is utilized in some form; even the basic sediment in the storage tanks is retreatd and every available drop of oil extracted and used. Gasoline is being extracted from the gases, even where the recovery is as low as one-eighth of a gallon of gasoline per 1,000 cubic feet of gas. Fuel oil and gas oil are being cracked, and recoveries of as much as 200 per cent more of gasoline are being had than were possible only a few years ago. These and many other economies are being practiced as the result of more efficient operations.

The average man's conception of an oil well is a derrick with a hole in the ground from which oil (if you are lucky) spouts freely. He has no understanding of the highly organized and technical assistance required to properly locate and produce petroleum, and to solve its transportation and manufacturing problems.

Solves Its Own Problems

It would, I am sure, surprise many people to know of the progress made by the oil industry in solving its own problems, or in bettering its own conditions. These problems and conditions embrace every angle of the business—the location of the well, keeping of accounts, producing, transportation and refining.

On the standardization of equipment tremendous progress has been made. Take the question of threads alone. The oil industry has established standard threads on every important connection used in the oil business, including all classes of tubular goods, cable tools, sucker rods, working barrels and rotary tools, such as swivel and grief stem couplings, tool joints, drill collars and fishtail bits. It has, in addition, standardized the gauges that are used to check these threads and has broadcast the information, making it available to manufacturers and users alike, so that threaded connections and taper joints can be made interchangeable between the manufacturers.

We were recently informed by a representative of the Bureau of Standards that the oil industry, through its A. P. I. standardization committees, had done more in the last two years to standardize threaded connections and establish master gauges than any other industry had done in 20 years, yet the oil industry is not known as a technical industry. This may serve to illustrate, however, some of the work that it is doing to solve its own problems.

Saving by Standardization

Specifications have been completed on 90 per cent of the equipment used in the drilling and producing of oil. The savings accruing from the use of proper standards can only be measured in millions. This opportunity for saving is not so much direct economies that will obtain in reduced warehouse stocks and increased flexibility in the handling of materials, but also the elimination of losses caused by fishing jobs due to improper threads, inability to secure proper mating parts in emergencies, etc. Standardization enables the buyer and seller to speak the same language. It speeds up the entire drilling and producing program at less cost.

Some concrete illustrations illustrating this economy, resulting from simplification and standardization, may suffice:

Three hundred and six different sizes of cable drilling tool joints reduced to 11.

Over 100 rotary drilling taper joints reduced to 7.

Two hundred different sizes and styles of derricks reduced to 11.

Fifteen to 20 different sizes of rig irons reduced to 3.

Twenty to 30 different sizes of sucker rods reduced to 3.

Standards have been set up on boilers, belting, wire rope and manila cordage, to insure uniform grades of material. Specifications are being formulated on steel storage and production tanks.

I recently received a communication from a prominent operator in the West, commenting on the service he is securing from A. P. I. standard equipment, as follows:

"I should like to call your attention to the fact that we have run 13 strings of sucker rods, averaging 4,000 feet, with A. P. I. box and pin heat treated. Up to date, we have not had a single pin break and but one or two unscrewing jobs."

Sufficient time has not elapsed to make an adequate estimate of the economies that will accrue to the oil industry by the use of specific standards. The elimination of unnecessary sizes listed above, however, is sufficient to indicate that the economies will run into millions of dollars annually.

Voluntary Effort

This work has been accomplished entirely through voluntary co-operative effort within the oil industry. The place of the engineer in this industry is becoming more important every day—and the present efficiency of the oil industry is directly the result of better engineering practices. It is natural that the larger companies should be the first to employ engineering practices in their work. The progress of the standardization work has only been possible by the use of these engineers, yet the entire industry, especially the smaller operators, has the opportunity to profit from their work.

Co-operation by the rank and file of producers is necessary to obtain these advantages, and to obtain the best results, as the supply companies from whom the average producer purchases 100 per cent of his equipment, can and will only carry such supplies as their trade demands. The larger companies, with their large warehouse stocks, not so dependent on the local supply houses, can and are adopting these better practices, almost 100 per cent.

The industry can, and I am sure eventually will, well emulate the example of these A. P. I. standardization committees in solving some of the problems now confronting it, by facing its problems squarely, giving freely of its experience and resolving to find a solution. The results, whether the answer be final or not, will always justify the effort.

LIKE SELTZER WATER

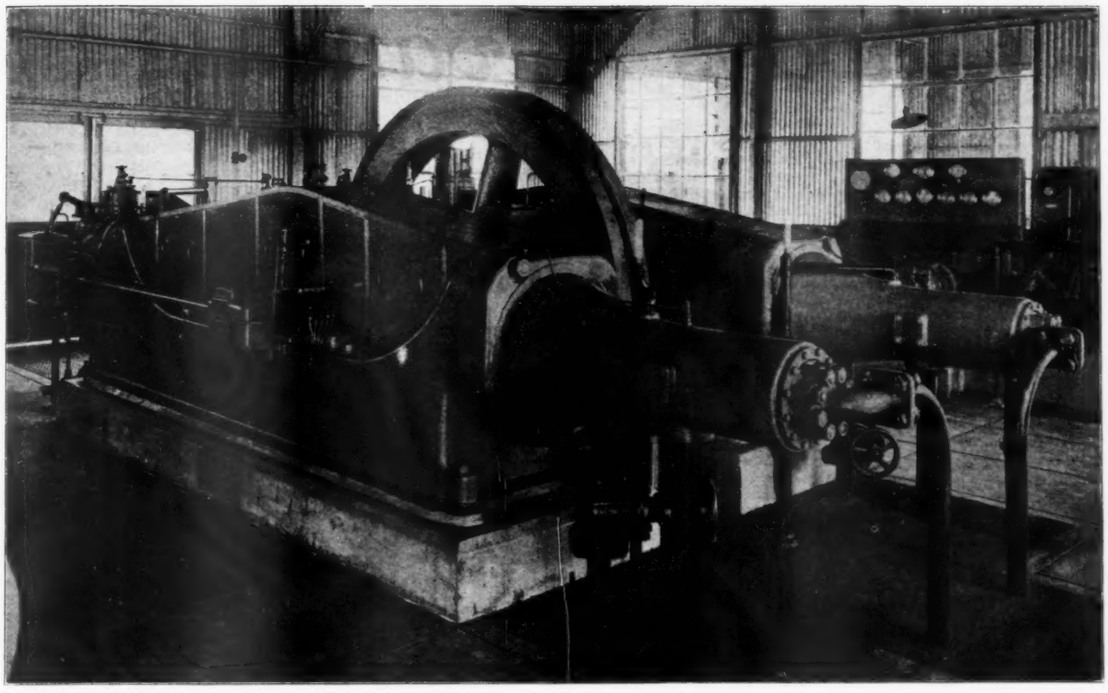
With minor exceptions, the oil is found in the almost microscopic pores of sands and sandstone, which occur in layers interbedded with shales and other impervious rocks. In these porous layers of rock the oil is accumulated in pools which usually occupy upfolds in the rocks and which are usually surrounded by water-saturated rock at lower levels. Dissolved in the oil, gas is found under high pressure, and when a well is drilled into the sand, this gas expands and forces the oil into the well, just as seltzer water is forced out of the bottle by the expansion of the carbonic-acid gas dissolved under pressure in the water.

At times there is a surplus of gas which separates from the oil and accumulates in the higher parts of the rock. This undissolved gas is known as free gas.

Much force is required to expel the oil from the fine pores of the rock. Under average conditions, the gas issuing with the oil represents an expenditure of energy equal to 10-horsepower hours for each barrel of oil brought to the surface. This means that the work required to expel the oil from the sand is equal to the work performed by a horse in a 10-hour day. So tightly held is the oil in the sand that it takes all of the energy stored in several barrels of oil to recover 1 bbl. of oil and to recover the remaining barrels of oil that have been robbed of gas, outside force must be applied.—J. O. Lewis.

WHERE STATES FAIL

It is not easy to obtain state legislation for the benefit of an industry, even when the reasons are perfectly plain. This is particularly true if the proposed act is in the least complicated. State legislators are often jealous of state sovereignty and independence. They are seldom willing to follow advice from industrial leaders, being almost invariably suspicious of such advice. They listen until they obtain a smattering of the subject and then feel prepared to make changes in bills submitted. The result often is that a salutory measure, carefully worked out by experts, is changed until when it goes to the governor for signature it bears no resemblance to the original measure proposed. And again, it often happens that the suggestion of one measure brings about a discussion of the general subject and the introduction of numerous other measures growing out of that subject, so that the industry's last state is worse than the first.—Amos L. Beaty.



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The installation pictured above shows a Cooper Type-80 twin engine equipped with compressors designed for compressing air to 2000 pounds for lifting oil. Two similar units were recently installed in the world's first commercial Helium Plant. Cooper compressors have been designed for pressures above 3500 pounds. If you have a high pressure compressor problem, better consult a Cooper engineer.

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Waste Almost Unknown in Oil Fields

Millions of Barrels of Crude Oil and Gasoline Saved Annually Through Improved Equipment and Practices

By Andrew M. Rowley

The "waste oil sopper" has passed as completely from the petroleum picture as has the man who surreptitiously poured his gasoline—a waste product then—into the creek at night to get rid of the supposedly useless fluid. Anyone who traveled around the oil fields even a few years ago had to pick his way among pools of crude oil scattered over the leases while creeks, ravines and other depressions and drainage ways usually contained large quantities of crude oil which came from newly completed wells, overflowing of lease and storage tanks or leaks in pipe lines.

Every oil field had its quota of "waste oil soppers" — men who made considerable money by gathering whatever quantity of this waste oil they could. In the old days it was a very profitable business, after a new field came in, for a number of oil skimming plants to be located in low places and along the creeks and streams passing through or near the field. The soppers would build a dam across the stream, drag in an old tank and hook up an old pump with some second hand pipe and proceed to skim the oil from the waters of the stream, this oil being wasted from the wells and tanks in the field. Some of these outfits would recover as much as 500 to 600 bbls. a day.

While much crude was saved by these soppers, only a small part of the total quantity was recovered and thousands of barrels literally "went down the creek" and were washed from leases whenever it rained. This loss in new fields often reached large quantities and, in cases where a wildcat well proved productive, often the entire production of the well for days and even weeks was permitted to flow unrestricted onto the ground because of lack of provision to handle the flow. While much of this oil was recovered later, either by putting a dam across a low place to hold the flow, or by digging pits into which the oil would run, the losses in crsde oil throrghout the country totaled a very large quantity each year.

No Such Waste Now

All of that now is a thing of the past and most wells are completed without the loss of a barrel of oil. This is due to improved methods, practices and devices used in drilling and in handling the production when the well "comes in."

There has been a phenomenal development in methods and equipment in the past few years in the effort made by the industry to save every barrel of crude produced and to eliminate all waste. That these methods and equipment have reduced waste to the vanishing point is demonstrated forcibly in the development of the most recently discovered big oil field, the Greater Seminole area in Oklahoma.

Few oil fields in the world witnessed a more intensive development. At one time in that area there were 552 wells being drilled. At that time, too, roads existed in name only. For days and even weeks at a time the whole area was a vast sea of mud. Hauling heavy equipment necessary to drill a well 4,000 feet deep transformed what roads there were into seemingly bottomless bogs. Such conditions, naturally, delayed getting necessary equipment to leases, held up pipe line construction and prevented the quick erection of storage tanks.

Yet with all these obstacles and handicaps, a close check on the whole Seminole area shows that of the 125,000,000 bbls. produced there up to the middle of November of this year, less than 25,000 bbls. flowed onto the ground. And, a major part of this 25,000 bbls. was recovered from pits dug to catch the crude. In other words 4,999 bbls. out of every 5,000 produced never touched the derrick floor or surface of the ground, and most of the 1 bbl. out of every 5,000 produced that did touch the ground was recovered later and saved.

Waste of crude oil is almost unknown in the oil fields today.

Improved Drilling Methods

In the first place, drilling methods have improved to such an extent the driller can ascertain conditions at the bottom of the hole and in formations through which he is drilling or intends to drill and can make preparations accordingly. When possible producing formations are approached, the formation is cored, that is, a sample of the formation is cut out by devices known as core barrels and this sample is examined by the driller, geologists of the company or concern drilling and production engineers and they are able to tell whether the formation contains oil or gas in commercial quantities. Another method is to "rat-hole," or to drill a small hole down into the formation so that if oil or gas is present in commercial quantities, there will be no "blow out" such as might occur if the larger hole being drilled were carried down into the producing sand or horizon.

While these precautions to prevent waste and loss of oil or gas due to any sudden blowout or drilling in of the well are taken at the bottom of the hole, other precautions are taken at the surface. High pressure control heads are placed on top of the casing and master gates are placed on the casing under the control heads. These may be closed, entirely shutting in the well until provision is made for handling the oil or gas found.

In numerous cases where the well is being drilled in an area regarded as proven territory, the preparations for handling the production go further and oil and gas separators are installed in place before the well is drilled into the producing sand. Stock tanks are erected, too, and arrangements made for pipe line connections. With arrangements such as these already completed before the well is drilled in, regular gushers making as high as 6,000 bbls. a day have been completed without the loss of as much as 5 bbls. of oil throughout the entire operation.

Separators and Better Tanks

Oil and gas separators have been improved with better connections and pressure relief valves so that now there is no loss of oil or gas in these separators, even though the well be completed under high pressure.

The old wooden stock tanks have been replaced with all-steel hermetically sealed tanks which are equipped with pressure and vacuum relief valves, and in this type of construction, the flow of oil through the tank to the pipe line or tank car can be controlled, thereby eliminating any waste caused by the tank's overflowing. There is no loss of oil and practically no waste of gas now under these conditions and with this new equipment, whereas in the "good old days", it was a frequent sight to see oil flowing over the top of the old-style storage and lease tanks.

In areas where the oil is produced under a high gas pressure, devices known as "Christmas trees" are attached to the casing. These are a series of high-pressure fittings which prevent a blowout.

The precautions to prevent waste are continued when the oil is placed in storage tanks. Improvements in the design of these tanks have greatly reduced evaporation. Government experts figured after extensive investigations several years ago, evaporation losses averaged 6.5 per cent from the well to the refinery and 2.1 per cent in the refinery or a total loss of 8.6 per cent. These same experts now state that through the installation of improved methods, including vapor-tight tanks and other devices, proper painting, etc., the petroleum industry has cut this loss 50 per cent during the past few years.

Reducing Evaporation

While little is ever heard about this saving by reducing evaporation the fact remains that in Oklahoma alone—just one oil-producing state—the saving on this basis would total nearly 33,000 bbls. of crude oil a day or more than 12,000,000 bbls. a year. And, based on an estimated production of crude oil this year of 900,000,000 bbls., this saving, due to improvements installed by the petroleum industry, would total 38,700,000 bbls. of crude oil in one year. This estimate is based upon results of investigations conducted by the Government in certain areas of the country. In these areas it is stated the evaporation loss has been cut in half. The same figures may not apply to all crude oil producing areas, due to the fact evaporation from low-gravity crudes would be less than from those of high gravity. But there is no question the petroleum industry is now saving millions of barrels of crude oil every year by the installation of equipment and devices designed to reduce evaporation.

The saving of the gasoline contained in natural gas produced with the crude oil now totals eleven billion, one hundred million gallons a year. Up until 1913, this gasoline was allowed to blow into the air with the gas and was not saved. Now the casinghead gasoline plant has entered the oil field to catch this gas that formerly was lost and squeeze or absorb from it the gasoline content. About 11 per cent of all the motor fuel used in the United States at this time comes from this source.

Portable gasoline plants have been developed. These plants can be taken into small fields and utilized to extract the gasoline from natural gas produced with the oil. Natural gas-gasoline plants take the gas from the storage tanks and from the oil and gas separators and the gasoline is procured either by compressing the gas under high pressure and squeezing the gasoline from it, or by absorbing the gasoline through the use of an absorption oil or charcoal.

In the Seminole Field in Oklahoma alone this saving of gasoline totals 700,000 gallons daily. This gasoline would not be available had not natural gasoline plants been developed and utilized by the petroleum industry.

Treating Bottom Settlings

Another big saving has been recorded by the petroleum industry in the treating of tank bottom settlings or the heavy, grease-like product found on the bottoms of storage tanks which have been filled with crude oil for a long time. Until comparatively recently, these settlings were shoveled from the tank and burned. The advent of the chemist and engineer into the oil business, however, resulted in tests being made of this seemingly waste product with the result it was discovered a good grade of gasoline, kerosene and other products could be obtained from these settlings.

An idea of what this saving means may be had from actual tests conducted by different companies. On a quantity of this bottom settlings, a centrifuge test at 140 degrees Fahrenheit gave 75 per cent petroleum products and 25 per cent water and waste. Results of the distillation test of the petroleum products were as follows:

Product recovered—	Per cent
Gasoline	15
Kerosene	16
Gas oil	20
Wax distillate	46
Coke	3
Total	100

The wax distillate yielded 10 per cent lubricating oil and 36 per cent wax. The records of one large company shows it has 468,000 bbls. of b.s. in tank bottoms. Assuming that these tank bottoms have a distillation as given above, the quantity of useful products that could be recovered by this one company alone are:

	Per Cent	Bbls.
Gasoline	15	52,000
Kerosene	16	56,000
Gas oil	20	70,400
Lubricating oil	10	35,200
Wax	36	126,800
Coke	3	10,500
Total	100	350,900

or 75 per cent of total.

Another step that has been taken by the petroleum industry in reducing waste is to "stabilize" the crude when held in storage for any length of time. One method employed by one company consists of passing the crude oil through a heat exchange in which the temperature of the oil is raised to 110 degrees Fahrenheit. The crude is then admitted near the top of a tower filled with grids which have a large total surface area. The oil gravitates down through the grids and is drawn off near the bottom in a stabilized condition. The gases are withdrawn from the top of the tower under vacuum, compressed and then condensed into gasoline which is used for blending purposes at the refinery. Heating the oil and taking off the lighter fraction, as described above, leaves the remaining oil in such a condition it is not subject to much, if any, evaporation loss, at ordinary temperatures.

Pipe Liners Reduce Loss

The pipe line companies have been most active in preventing waste. In the old days the course of a crude oil pipe line could almost be traced across the country by the oily condition of the ground around it and by the pools of oil scattered along the route. It is entirely different now. The pipe line companies employ line walkers, just as do the railroads, and these line walkers have certain sections of the crude oil pipe line which must be traversed every day. It is the duty of a walker to see that the line is maintained in good condition, to report any leak as soon as it develops and to see that such leaks in the line are repaired at once.

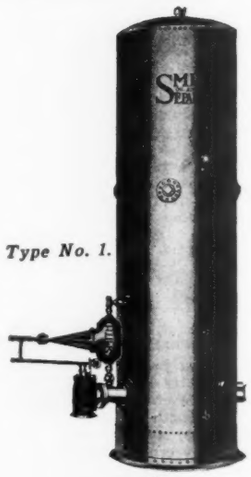
A check on the quantity of oil going out of one station on a pipe line with that received at the next station along the line is also kept and the instant one station's record does not coincide with that of the sending station, a crew of workmen is sent over that section of the line between the stations to ascertain the cause. In other words, a station on a pipe line pumping oil through the line to the next station keeps a record of how much oil is being sent from the station. The station receiving the oil also keeps a record of the quantity of oil coming into the station. Telephone and telegraph lines strung along the line permit instant communication between stations and each station is advised as to what the other stations are doing and what oil is being sent through the line. Just as soon as the record of any station indicates that station is not getting the full quantity of the oil being sent through the line, it is known something is wrong and an investigation is made at once to determine the source of the leak. In that way leaks are detected quickly and very little oil is lost.

Better couplings for pipe lines, improved machinery in the stations and the use of machinery in laying the lines also have contributed greatly to reducing losses due to breaks in the line, for this improved equipment stands up better under the strain than did the old, and permits the construction of a better pipe line.

"If it's worth drilling for it's worth saving"

SMITH SEPARATORS

Type No. 1.



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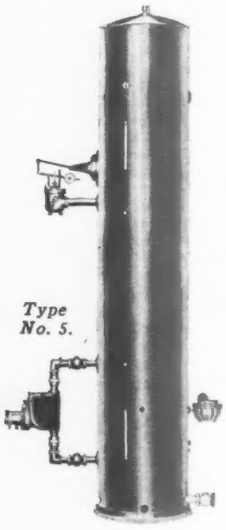

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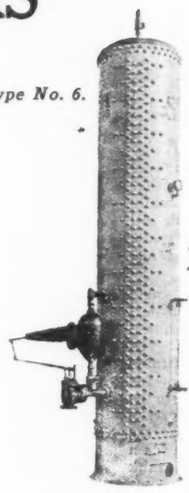

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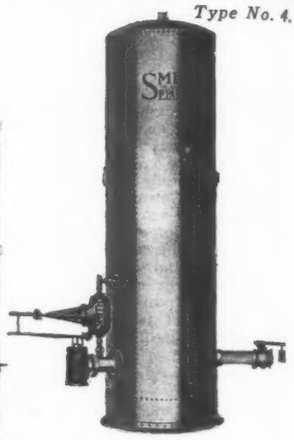
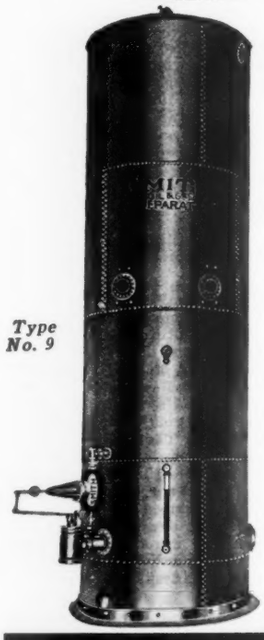
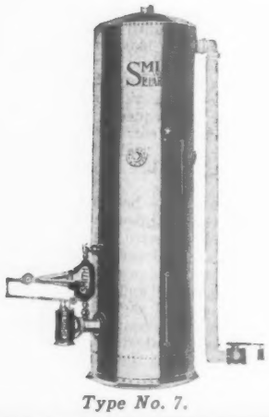


There's a type for every service and a size for every production need

Type No. 9





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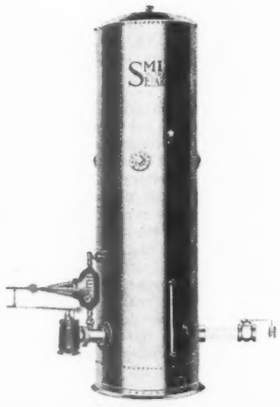

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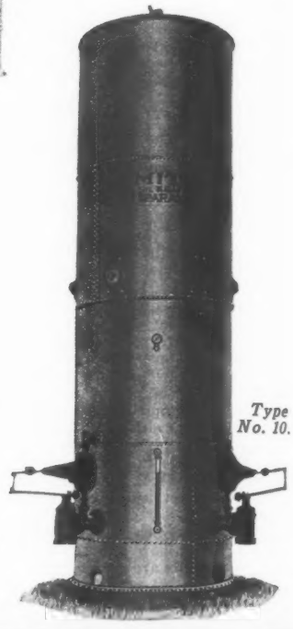
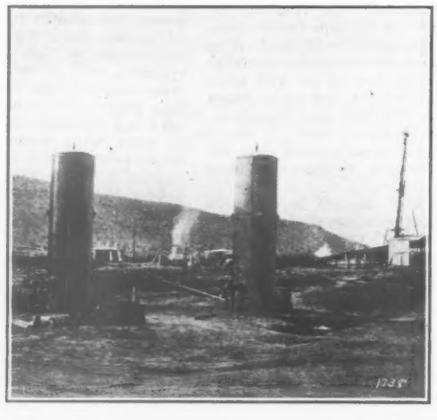


Below is shown a Smith Separator Type No. 7 on Prairie Oil and Gas—Stedham No. 8 in the Earlsboro Field.

Below, Smith Separators for Mid-Kansas Oil & Gas Co., Yates Pool, Texas.

Below, Smith Separator Type No. 6 on Magnolia Petroleum Company—Robertshaw No. 21.



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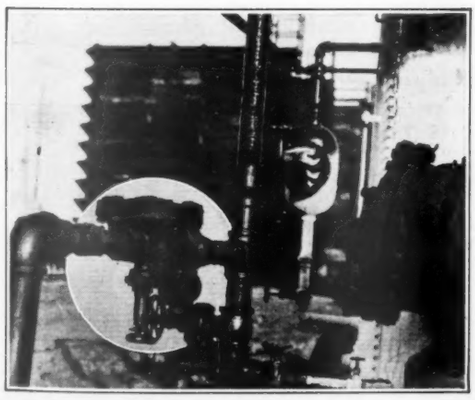
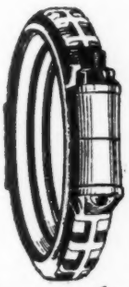
Below is a picture of Fisher Type 295 Back Pressure Control Valve, operating on stabilizers in Natural Gasoline Plant, Oklahoma.



12" gas line Sinclair Oil and Gas Company equipped with Victaulic Couplings.

VICTAULIC COUPLING



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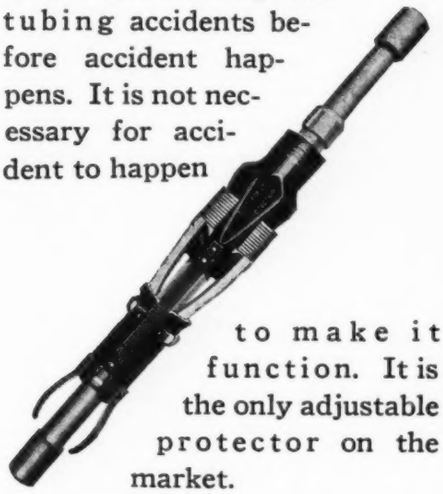

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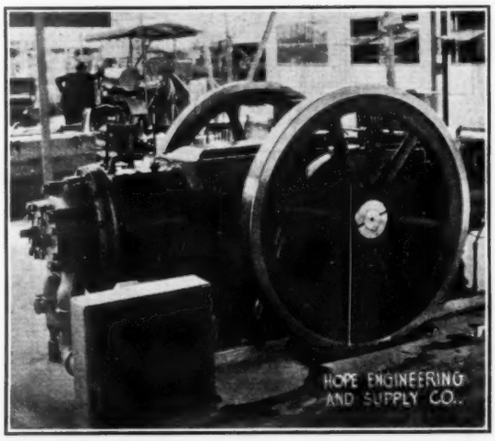

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Gasoline and Crude Price Relationship

Consumers Given Benefit of Crude Schedule Reductions. Latter Only One of Several Factors in Gasoline Price

By C. O. Willson

What is the proper relationship between crude oil prices and the service station price of gasoline to the consumer?

A variety of answers have been made to this question both in and out of the oil industry. Based on some of the views expressed during the period of declining prices this year retail gasoline prices should be decreased in direct proportion to the posted crude oil prices at the well. That is to say, when crude oil prices were reduced 50 per cent then there should be the same reduction in the consumers' gasoline price.

The absurdity of this particular viewpoint is apparent when the argument is carried out to its final objective. In the final analysis this would mean that if crude oil was over produced to the point that it was being given away at the wells then a consumer of gasoline should be able to drive up to his filling station and have his gasoline tank filled without charge.

The truth of the matter is that the price of crude oil is only one of several factors entering into the cost of gasoline to the consumer. And it is also true that due to increases in refinery efficiency and the increasing importance of other factors this crude price is constantly decreasing in significance.

The accompanying tables were prepared to show how the consumers' price for gasoline is divided at the present time. The three consuming points chosen are representative of the Middle West except that the Detroit price is about 1 cent a gallon below normal. The refiner and crude oil producer shares are representative of actual conditions in Oklahoma as they have obtained for several months.

HOW THE CONSUMERS' PRICE FOR GASOLINE IS DIVIDED

	Milwaukee		Detroit		Davenport, Iowa	
	Share Cents	Per Cent	Share Cents	Per Cent	Share Cents	Per Cent
Gasoline tax	3.00	16.5	3.00	16.8	3.00	17.1
Service Station Operator	2.00	11.0	2.00	11.2	2.00	11.4
Bulk Station Operator	3.74	20.7	3.32	13.0	3.41	19.5
Rail Transportation	2.61	14.4	3.73	20.7	2.34	13.4
Oklahoma Refinery	*2.37	13.1	*2.37	13.3	*2.37	13.5
Oklahoma Crude Oil Producer	4.38	24.2	4.38	24.6	4.38	25.0
Retail Price	18.1	100.0	17.08	100.0	17.05	100.0

*Includes pipe line charge.

Gasoline Tax

It will be noted that some of the charges against the price paid by the consumer at the service station are fixed. The gasoline tax which has become one of the largest items in the retail price of gasoline is the same the year around except when legislatures convene and advance the tax rate. As explained in another article in this issue gasoline taxes are in effect in 46 states and the District of Columbia. The tax varies from 2 to 5 cents. In almost half of the states the tax rate was advanced during the past year. There is not a single case on record where a state has reduced the tax.

Another fixed charge is that of rail transportation. The rates are fixed by the railroads subject to the approval of the Interstate Commerce Commission and are seldom changed.

The division made by the bulk station operator and the service station operator varies in different sections. In most cases the service station or retail price for gasoline is 2 cents above the so-called tank wagon price. The latter is the price received by the operator of the bulk station. In some instances the service station is allowed a greater margin than 2 cents on which to operate. In these cases any increase comes out of the margin allowed the bulk station operator so that the consumers' price is not affected.

In most cases the bulk stations and the service stations are owned and operated by the same company of individuals so that the division of costs between the stations is not material so far as total expenses are concerned. Considered together they constitute the total marketing cost. In general the bulk station cost includes the unloading of the gasoline from the tank cars as received from the refinery, storage and pumping facilities and distribution to the service station in tank wagons or trucks. The service station charge includes the investment in the retail station and the actual cost of distributing the gasoline to consumers.

The re[illegible] the crude oil producers s[illegible] the retail price of gasoline is [illegible] difficult to divide. In the accompa[illegible] an average grade of Oklahoma [illegible] of 36 gravity was taken as th[illegible] the crude charge. This grad[illegible] now bringing $1.28 at the well.

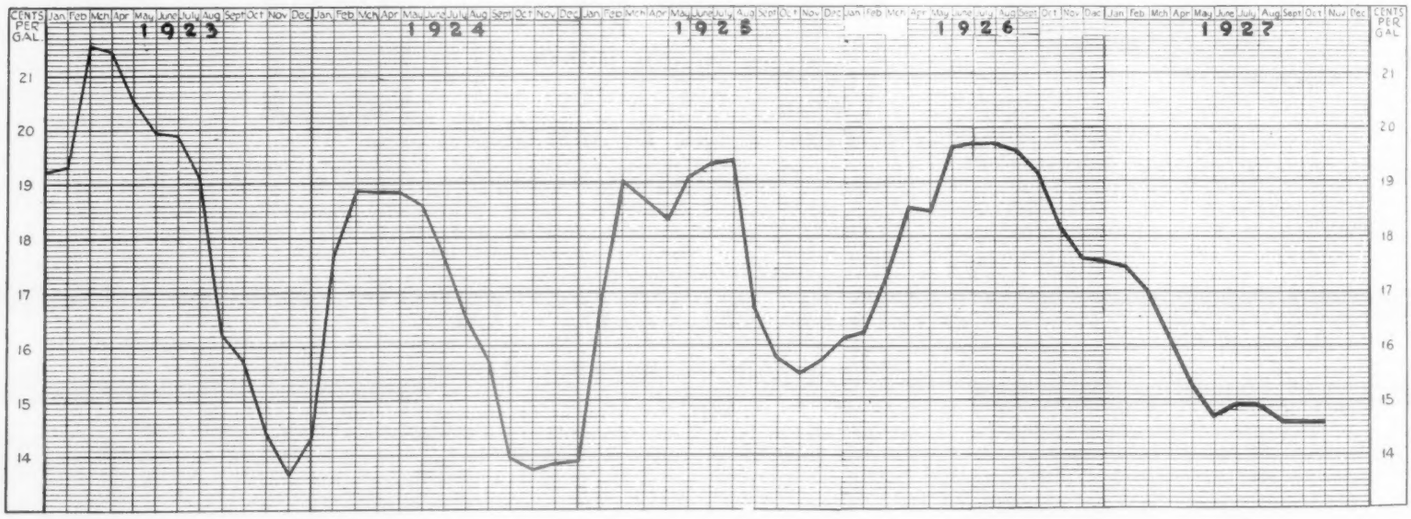
Producer and Refiner

The [illegible]line price at the refinery was t[illegible] 6¾ cents per gallon. This is [illegible] above the actual price being obtained by Oklahoma refineries at the present time although the cost figure is generally placed at 7 cents or above.

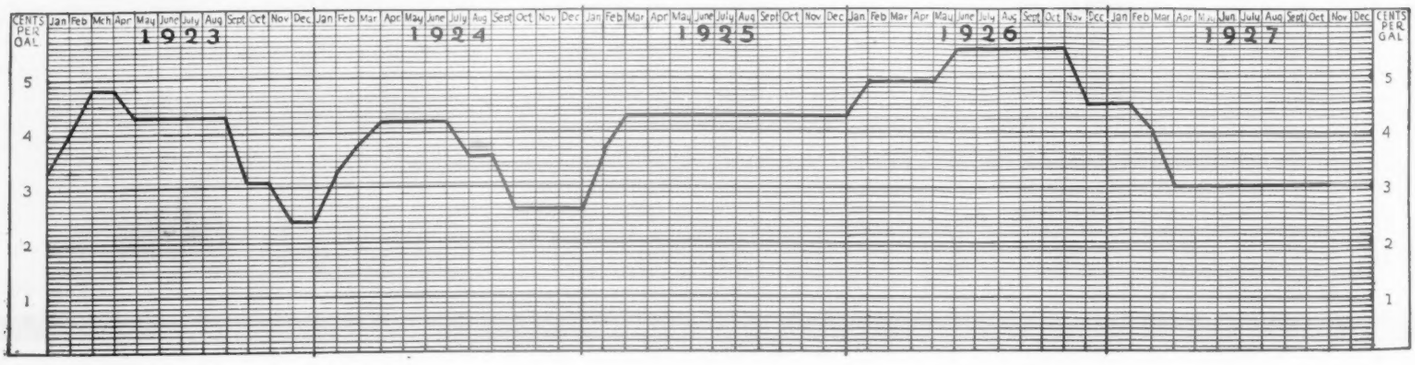
In determining what part of this 6¾ cents should go to the refiner and what part to the crude oil producer it is first necessary to determine the refinery cost. Having determined an average refinery cost the next step is to divide this cost among the several products obtained from the crude including kerosene, gas oil, fuel oil as well as gasoline. This is usually done by alloting each product a cost figure based on the total value of the product obtained from the crude oil. In this method of calculation gasoline carries the bulk of the load in refinery operation due to the fact that approximately 50 per cent of the crude in Oklahoma is refined into gasoline which also brings a higher per gallon price than any of the other products mentioned.

By this method of dividing costs it was determined that 2.37 cents of the

Average tank wagon gasoline price in fifty representative cities exclusive of taxes. Prices given in cents per gallon.



Average price for 36 gravity Oklahoma-Kansas crude oil. Prices given in cents per gallon.



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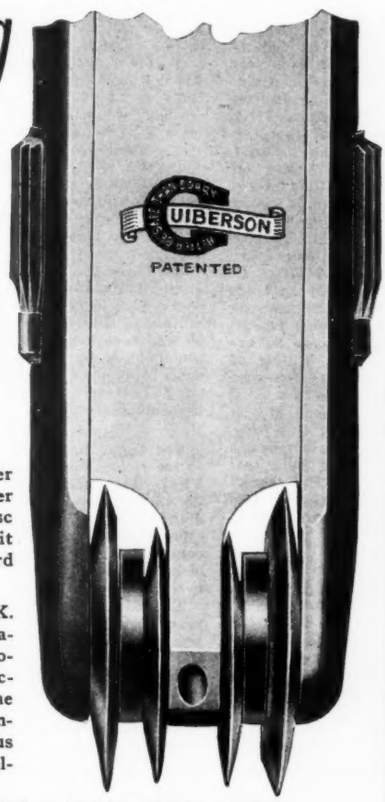

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6.75 cents received by the refiner for a gallon of gasoline should go to the refiner for the manufacturing operation and 4.38 cents to the crude oil producer for furnishing the crude oil from which the gasoline was refined.

At most Oklahoma refineries the crude oil is obtained by relatively short pipe line hauls from the fields to the refinery. This charge which will average from 20 to 30 cents per barrel was included in the refinery operating cost.

Crude Oil Factor

It will be seen in the accompanying table that the share of the crude oil producer in the consumers' gasoline price does not exceed 25 per cent at any of three consuming points shown. Thus when an automobile owner drives up to a station at Milwaukee and pays 18.1 cents for a gallon of gsaoline less than 4.5 cents of that charge goes to the producer who finds the crude oil and pays all the charges for bringing it above ground.

In states where the gasoline tax is 5 cents per gallon, the consumer is actually paying more to the state in the form of a direct tax than he is the producer of crude oil. For the country as a whole excluding New York and Massachusetts which do not as yet have taxes, the average gasoline tax is about 3 cents which represents about 15 per cent of the average retail price of gasoline.

Refining vs. Transportation

It will come as surprise to many that the railroads for transporting the gasoline from the refinery to the consuming point often receive a greater share of the retail price than does the refiner who takes the crude oil and makes it into gasoline. As is shown in the accompanying table this is actually the case at Detroit and Milwaukee while at Davenport the two charges are practically the same. Although there are some points close to the refineries where the transportation item is of minor importance, for the country as a whole it is one of the major costs in making the gasoline available to consumers.

In regard to transportation costs it is sometimes pointed out that a few of the larger refineries are located in the main consuming areas where they can distribute their gasoline with relatively short rail hauls from the refineries to the bulk stations.

It will be found, however, that while these refineries may save on the rail transportation of the finished gasoline they have, nevertheless, not been able to get away from the transportation charge. The bulk of crude oil production is found in the states of Oklahoma, California and Texas. Refiners with plants outside these states must first pay a heavy pipe line charge for transporting the crude oil from the fields. In the case of the refineries located in the eastern part of the United States this means a long pipe line haul or combination pipe line and water transportation. This simply means that the transportation charge is present in the retail price of gasoline regardless of whether it is in the form of rail charge for the finished product or a pipe line and water charge for transporting the crude oil. In most cases it is a combination of both. The amount of the transportation will, of course, vary with the distance transported.

Situation General

This situation will become clearer if a refining center outside of Oklahoma is taken as a base with different consuming points than those given in the table. It will be found that the six major divisions of the consumers' gasoline price will continue to be effective. There will be minor changes in the relative importance of the six factors but not enough to later materially the conclusions which have been pointed out. Crude oil prices and gasoline prices at the refineries and service stations are established under the keenest competitive conditions and this fact assures uniform prices except for the differences in transportation costs and gasoline taxes and the slight advantage one company may have over another in regard to crude oil production and refinery costs.

The foregoing discussion has, it is hoped, largely answered the original question as to the proper relationship between the crude oil prices at the wells and gasoline prices at the service station. It has been shown that approximately 75 per cent of the retail gasoline price is accounted for by charges other than the crude oil cost. The gasoline tax, marketing and transportation costs are not changed by changes in the price of crude oil. Refinery costs are sometimes changed when crude oil prices are advanced or lowered but these changes are of minor importance.

Prices for crude oil at the present time are exceptionally as are the refinery and retail gasoline prices. When crude oil prices are advanced to more normal schedules there will be advances in the gasoline prices. Fortunately for the consumer, however, these advances will be on the same percentage basis as the crude oil.

Crude Price Situation

It was stated in the beginning that the crude oil price was decreasing in importance as a factor in the final retail price of the gasoline. This is due to two reasons. In the first place the trend toward higher gasoline taxes obviously tends to detract from the importance of any of the other items which enter into the retail price. The second factor is the increased efficiency of refineries. It is generally known that including the gasoline obtained from the natural distillation of crude oil, cracked gasoline and natural gasoline the average recovery from crude oil has been doubled during the past few years.

This accounts for the fact that gasoline prices are constantly getting lower in relation to the price of crude oil. The more gasoline obtained from a barrel of crude in the manufacturing operations the less the importance of the latter in determining the price of the former. This is simply an application of a general rule in which the importance of changes in raw material is directly proportional to the amount of the material required to manufacture a finished product.

Price Relationship

However, as has been explained, crude oil is one of the major factors entering into the cost of gasoline. It follows that any price changes should be reflected in the retail price of gasoline. It is sometimes contended that gasoline prices are advanced or lowered without any regard to the crude oil price situation.

The accompanying chart shows that these contentions are not supported by the facts. The tank wagon price is an average figure for 50 cities which are scattered in 46 states. This curve gives a consumer market situation for the entire country. The crude oil price curve is based on a 36 gravity crude which is representative of the price changes for the entire Mid-Continent Field. This field in turn reflects changes in price effecting the entire petroleum industry.

The two curves reflect the fact that the consumers of gasoline in all parts of the country have been given the benefit of the depression in the oil industry this year which forced crude oil quotations and all refined products to exceptionally low levels. This reduction has been in line with the importance of crude oil as a factor in the total cost of placing gasoline in the consumers' market.

Lease Terms Force Overproduction

Even Government Permits Are Designed to Hasten Drilling of Nation's Oil Reserves. Chairman Work's Protest

The present system of leasing prospective oil lands, and the current manner of subdividing land holdings have contributed largely to the rapid expansion of flush fields.

Under the ordinary terms of the usual type of oil and gas leases, the lessor is compelled to protect his lease holdings by starting drilling immediately after any wells are drilled into the sand offsetting his property. This clause, which was originally intended to protect the various landowners against the dangers of property drainage, has done much to promote the unusually expansive drilling activity witnessed during the past year in the Greater Seminole area of Oklahoma. It could cause a similar disaster in any portion of the Mid-Continent Field, for in almost every region of that territory, the same leasing conditions exist

The lease forms used for taking oil and gas leases in the Mid-Continent Field either contain or have implied, a clause which provides for the starting of wells to protect the property from drainage by offset wells. To quote one form, "Lessee agrees to immediately offset all paying oil or gas wells drilled on lands adjoining this tract, and it is expressly agreed that no implied covenants regarding the measure of diligence to be exercised by the lessee in the drilling of said land during the original five-year term hereof shall be read into this lease, it being the express agreement of the parties that the provisions of this paragraph set forth the exclusive conditions under which the lessee shall hold this lease for said original term of five years."

Another form of lease previously used states: "If, while this lease is in force, and prior to the discovery of oil or gas on said leased land, there shall be drilled on adjacent land, and within 200 feet of any line of said leased land a well producing as much as 25 bbls. of oil per day for 30 consecutive days, the lessee will with reasonable diligence begin and prosecute the drilling of a well on said leased land in a faithful effort to find and produce oil in paying quantities."

Upset by Small Leases

A few 10-acre leases did more to upset the most carefully laid plans than any of the numerous contributory causes which led to the mad rush to drill the Seminole field.

During the fall of 1926, the Searight and Seminole pools were producing, and one Wilcox sand well in the Earlsboro sector had been completed. On the south edge of the Seminole city pool, the fatal 10-acre tracts were located; and when wells were completed offsetting their lines, the owners of these leases were naturally compelled to start drilling. The very porous nature of the Wilcox formation in this field is thought to have permitted the effects of drainage to exert a wider influence than in the majority of operations, and the fear that drainage would affect the leases a quarter and even half a mile from the lines of the small leases led to an insistence upon the part of the royalty owners that the leases near producing properties be started immediately.

It has been estimated that over 90 wells were started as a result of small acreage tracts.

The average lease in the Seminole area contained 40 acres. Many 80-acre leases were in the field, and a few tracts containing 160 acres. Had the parcels of land been larger, the fear of drainage would have been lessened due to the wider spread of the leased land, and much unnecessary drilling would have been eliminated.

Government Leases

The Osage Nation of Oklahoma is one of the richest spots in the Mid-Continent Field. The Osage leases are sold at public auction, conducted by the Osage Indian Agency at Pawhuska, Okla. The average lease tract sold at these sales comprises 160 acres, or a quarter section of land. The minimum price required for a single lease is $2,000.

The sales of the Osage leases have for years been the scene of an intensive competition, and bids running up to $1,990,000 have been made for a single lease.

Secretary Work, chairman of the Federal Oil Conservation Board, at the first of the public hearings on conservation of our oil resources, said the United States Government was the largest landowner in the United States and that "the amount of petroleum now being taken from the public and Indian lands represents one-tenth of this country's annual petroleum recapture which suggests that the Government itself is no neglible factor in the current production of petroleum." The secretary also said that there were outstanding 457 leases on government oil and gas lands, the leases having been made obligatory by the enactment five years previous by congress of the general leasing law. The secretary called attention to the fact that on March 3, 1921 there were about 1,000,000 acres of land in the Osage Reservation alone unleased for oil and that to comply with the applicable law, approximately 100,000 acres must be offered for leases annually, irrespective of the economic conditions of the Indians.

Chairman Work's Protest

"It is unwise to attempt measures for the conservation and orderly development of the oil resources of this country, with mandatory provisions of law forcing a disregard of the best interests of the Indians, the general public, the oil producers, and the oil industry." Continued Secretary Work, "We have twice asked Congress to repeal or modify this statute and to vest discretion and authority in the Department of the Interior.

"The most productive areas of these government oil and gas lands have passed, through the process of governmental lease, to the control of industrial leaders who have exploited and developed them with amazing thoroughness and speed, at a time, too, when petroleum production in this country was at a peak. The Government itself is not without blame in this exploitation.

"The result is that in 1921 a trifle more than 2,000,000 barrels of petroleum were produced from our naval reserves. Production from this same source increased steadily until 1924, when the peak of production was reached—13,000,000 bbls. for the year. Then, in 1925, a decline set in—a decline which registered 1,000,000-bbl. decrease for the year.

"The same condition characterized the productivity of the Indian oil lands. In 1921, 30,000,000 bbls. were produced, and in 1923 came the peak, with 54,000,000 bbls., which declined to 48,000,00 in 1925.

"On the public domain production figures tell the same story. In 1921 nearly 10,000,000 bbls. of petroleum were produced. The peak came in 1923 with a 36,500,000-bbl. recovery. Again the decline, first in 1924, with a full 1,000,000-bbl. decrease, as compared with the 1923 production."

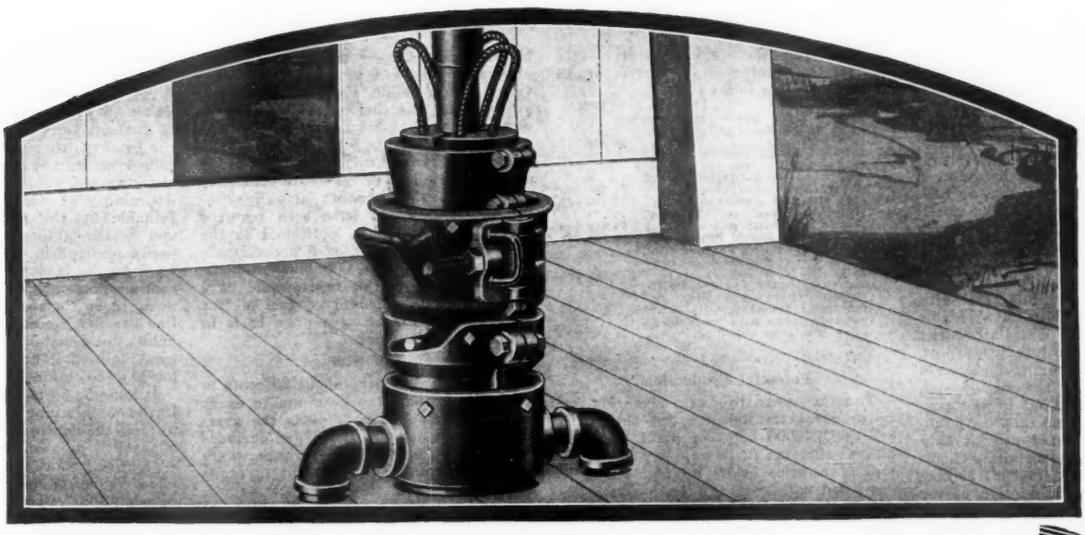
War-Time Production

It is to be regretted that Secretary Work did not tell the production of the naval reserves in 1917 and 1918 when the Government needed oil as it never needed it before or since. But if the reserves produced no more than 2,000,000 bbls. in 1921, an average of less than 5,500 bbls. a day they surely were not producing enough in 1917 and 1918 to supply fuel oil for more than one of the big troop or supply ships that were plying between the United States and Europe. It was not until there was a general overproduction of crude in the country that the government lands yielded their largest and their production declined along with that of other fields that had taken part in the over-supply of oil.

Government leases and permits to drill require the lessee or permittee to start a well in one or in two years, even on absolutely wildcat acreage far removed from a market and regardless of general oil market conditions.

At every sale of Osage lands, in recent years at least, the buyers of tracts were required by the terms of their lease to start a well within one year of the date of approval of the lease. The great

(Continued on Page 212)



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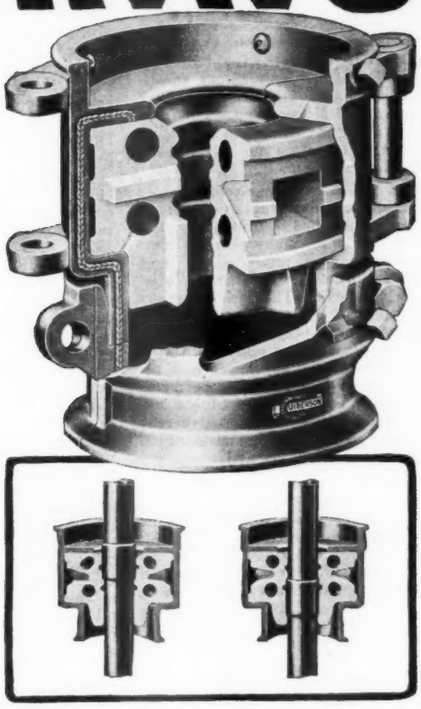

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Economics of the Use of Petroleum

Fuel Oil as a Factor in Conservation. Price Finds Oil and Produces It and Limits Its Uses

Petroleum, either in its crude or finished state, is largely used as fuel—as gasoline for automotive engines, as refined oil or kerosene for illumination and heat, as lighter distillate oils for Diesel engines, as the heavier oil for steam generation. During periods of its overproduction much petroleum has been forced into direct competition with coal as fuel, for the reason that owing to its inherent character the cost of artificial storage has been necessarily high. This competition of fuel oil for steam purposes with a commodity, the value of which is solely dependent upon its thermal efficiency, therefore has been unavoidable as it offered the only immediate outlet for an economically unstorable surplus. Since, however, this country possesses abundant and available reserves of coal, its substitution for fuel oil in the generation of power on land, and as bunkers for cargo ships, would present only inconvenience and no important difficulties to commerce, should fuel oil become unavailable through a diminution of the supply of crude. The relatively few uses in which coal cannot supplant distillate oils are naval and military requirements, enriching coal gas, glass manufacture, special steel manufacture and certain other specialized processes of commerce. In the determination of these uses—the aggregate of which constitutes but a small percentage of the total national consumption of petroleum—the price of coal is not a factor, but in all other uses, in which the price of coal is a factor—and particularly the use of oil as fuel under boilers—a moderate enhancement of the value of petroleum would result immediately in its displacement by coal.

Order of Uses

By the same economic process any of the major products of petroleum will be displaced by substitutes as their cost advances to a level which will give the substitutes a price advantage. Should there ever occur a period of actual shortage in the petroleum industry, substitutes available in commercial quantities would displace petroleum products in the following sequence:

1. As liquid fuel for power purposes on a price basis in competiton with coal.
2. As liquid fuel for use in the marine trade where cost of oil as compared with coal is not of paramount importance.
3. As gas oils and distillate fuels.
4. As kerosene used for heating, power and* lamp oils.
5. As fuel for Diesel motors.
6. As fuel for gasoline engines.

At such time in the distant future as the production of crude oil declines, or the consumption of finished products increases to the point of threatening a shortage, prices will advance and consumption will decrease, beginning with the use of oil for which a substitute is obtainable at a lower cost. This means, first, curtailment in the use of fuel oil for steam purposes. When the cost to the consumer of petroleum for power purposes becomes higher than that of coal, there will be a conversion from oil to coal, with a corresponding reduction in the consumption of the heavier petroleum products. Fuel oil so released will be available for conversion into products of higher value and thus an augmented supply of the more essential products will be available.

Present Uses Classified

An analysis of deliveries during the past year suggests this as a practical solution of the question of increased supplies for the most essential uses. The quantities derived from crude oil and delivered into the six classes previously enumerated, expressed in barrels of 42 gallons, were as follows:

	1926
1. Fuel oil for power purposes on a price basis in competition with coal	268,633,000
2. Fuel oil for use in the marine trade where cost of oil as compared with coal is not of paramount importance	75,291,000
3. Gas oils and distillate fuels	32,400,000
4. Kerosene used for heating, power and lamp oils	60,389,000
5. Fuel oil for Diesel motors	52,960,000
6. Fuel for gasoline engines (not including casinghead or benzol)	277,959,000
In addition to these six classifications there was also extracted lubricating oils, wax, asphalt, coke and miscellaneous products totaling	63,382,000
Total	830,954,000

Potential Production

Thus last year, to obtain a market for its products, the industry was obliged to sell 268,633,000 bbls., or 32.27 per cent of its output as fuel for power purposes, and at a price below its fuel value as compared with coal. If the consumption of gasoline in that year had been sufficiently greater than it proved to be, and this extra demand had existed at a price which justified the installation of the necessary equipment, the petroleum industry, by cracking this 268,633,000 bbls. of heavy oil could have produced an additional 107,453,000 bbls. of gasoline and still have left a residue of approximately 150,000,000 bbls. to be utilized as fuel for power purposes. This statement is based upon the assumption of a yield of 40 per cent of gasoline by cracking heavy oils, a commercial recovery possible by any of the various cracking processes. The theoretical yields of these processes are as high as 75 per cent and with the perfection of refinery technique, which is steadily in progress, it is not too much to expect that this recovery will eventually be realized. As it was, 93,736,000 bbls. of the 306,470,000 bbls. of gasoline produced in this country during 1926 came from cracking operations, while 178,319,000 bbls. came from the straight distillation of crude, 32,304,000 bbls. came from natural and casinghead gas and 2,111,000 bbls. from benzol.

Possible at a Price

It has already been set forth that deliveries of petroleum and its products into consumption, not including casinghead and benzol, during the past year totaled 830,954,000 bbls. Of this quantity 277,959,000 bbls., or only 33.45 per cent was gasoline. It has also been shown in this memorandum that by the construction and operation of additional cracking equipment it would have been possible last year to have produced an additional 107,453,000 bbls. of gasoline from the quantity of fuel oil sold, at a price in competition with coal. Therefore, if the true conservation of crude, which is to say the conservation of crude to be used to supply the future demand for the more essential products—gasoline and lubricating oil—had been the dominant factor in the petroleum situation last year, and had the necessary equipment been in operation, we estimate that the demand for gasoline and lubricating oil could have been supplied from approximately 66.39 per cent of the crude that was actually run through the refineries. A supply of crude last year of, say, 517,400,000 bbls., would have been sufficient to meet the requirements for gasoline and lubricating oils, so that from the standpoint of these requirements, the overproduction of crude, including imports, was at least 330,561,000 bbls.

If the production and imports of crude last year had been only 517,400,000 bbls., the price would have been higher and there would have been no fuel oil available for sale on a coal price basis. The residual products, through the additional investment of large sums in cracking facilities would have been in part converted into gasoline, the balance being available for the various special uses indicated.

However, if all the other products, such as kerosene, Diesel oil, asphalt, wax, gas oil and fuel oil at prices above coal were supplied in the amounts actually consumed, there would have been required about 62,000,000 bbls. additional to the 517,400,000 bbls. mentioned above, making the total 579,400,000 bbls. and the overproduction on this basis would have been simply the amount of fuel oil for power purposes sold on a price basis in competition with coal.

Cost of Storage

It costs the industry about 20 cents to 25 cents per barrel per annum to carry crude oil in storage. This is the average of fresh and old crude and includes evaporation losses, fire insurance, taxes and interest on the investment in crude and tankage. This cost in so far as normal stocks are concerned is a necessary overhead charge on the industry, but to the extent that stocks increase above normal, this additional cost is one of the penalties imposed by overproduction.

The cost to the industry of "dumping of surplus on the fuel market" is competition with coal cannot be accurately computed. There is no measuring stick for the reason that there is no established value or intrinsic worth for petroleum. The maximum value of any product is the price at which a satisfactory substitute can be made available or at which consumption will be curtailed. This condition has never arisen in the petroleum industry, and therefore no estimate of economic cost can be made.

While it is fully recognized that we are depleting our petroleum resources, it is at the same time confidentally felt that there will be for many years to come an ample supply of crude oil to meet economic requirements for the essential petroleum products. The law of supply and demand will control the use of petroleum. As the supply of crude oil decreases, values will rise and substitution through conversion of the lower cost petroleum products will gradually be made. The increasing cost of the products will result in their more efficient use, thereby progressively reducing their consumption.

Less Gasoline to Mile

The petroleum industry has seen kerosene, which 20 years ago was the primary product of crude oil, replaced as an illuminant by electrcity. Is it not, therefore, entirely possible that in the future, through inventive genius both in the mechanical and chemical fields, more efficient motors and power generators will be developed which will use other sources of energy than the gasoline motors of today? In such event, if we were to conserve gasoline today, is it not possible that we might find we had done so against a time when its use will be obsolete? The direct result of the increased use of fuel oil in competition with coal during the past few years has been to provide the industry with an outlet for that portion of the production over and above the petroleum requirements for essential purposes. The industry did not itself possess the financial ability to store the quantities of crude produced and the outlet for fuel oil thus furnished was absolutely necessary. Furthermore, this extra supply of crude furnished efficient and economical fuel for transportation, industrial development, irrigation purposes, etc. The public was, therefore, directly benefited by a production of crude oil in excess of the quantities actually required for essential purposes. The use of fuel oil from this standpoint should not be considered as wholly non-essential or that it was used uneconomically.

No one would question the theoretical desirability of avoiding the substitution of fuel oil for coal in those sections of the country where coal can easily be obtained without excessive transportation charges; nor would any one question the desirability of doubling the mileage attainable by the automotive engine—an end which automotive engineers could easily accomplish. The barriers are clearly economic. Competition of fuel oil with coal has come about from the normal economic operations of the country. Gasoline has never cost enough to induce the public to demand and use the type of cars required if greater mileage per gallon is to be obtained.

It must be borne in mind that the problem of maintaining a supply of petroleum to meet the demand has not been initially a physical problem but one of economics—of price performing its normal function of increasing or decreasing production or consumption. Given a sufficient reward in the form of price, efforts to obtain new production are at once stimulated. A higher price immediately operates to divert the stream of petroleum into the channels of its most essential uses and so minimizes its noneconomic use and consumption. The least economic use of oil, that is, in competition with coal, is directly due to price. Price, which is always fixed by competition, will be the factor about which every proposal for conservation must primarily revolve. Price finds the oil and produces it. Price controls and limits its use.

*Kerosene used where there is no other illuminant is, strictly speaking, in a category by itself, but the amount is probably small in proportion to the total.

STORY OF FEDERAL OIL LANDS

In 1921 a trifle more than 2,000,000 bbls. of petroleum were produced from our naval reserves. Production from this same source increased steadily until 1924, when the peak of production was reached—13,000,000 bbls. for the year. Then, in 1925, a decline set in—a decline which registered a 1,000,000-bbl. decrease for the year.

The same condition characterized the productivity of the Indian oil lands. In 1921, 30,000,000 bbls. were produced, and in 1923 came the peak, with 54,000,000 bbls., which declined to 48,000,000 bbls. in 1925.

On the public domain production figures tell the same story. In 1921, nearly 10,000,000 bbls. of petroleum were produced. The peak came in 1923 with a 36,500,000-bbl. recovery. Again the decline, first in 1924, with a full 1,000,000-bbl. decrease, then, in 1925, with a 7,000,000-bbl. decrease, as compared with the 1923 production.

This is the story briefly of the Federal oil lands.—Secretary of Interior Work.

SUPPLY FOR MANY YEARS

The key to finding the unknown and necessary reserves of oil in the future, as in the past, must be freely moving prices which, when production is insufficient to meet demand, will furnish an incentive for men and capital to take the large risks incident to an uncertain and hazardous enterprise. Search and more search, drilling and more drilling, continued combing of areas within which oil fields may be found, drilling of many thousands of "wildcat" wells, individual losses, large additions to capital and the application to production and consumption of the best scientific methods, and at times rapidly increasing prices, which will be most unwelcome, are the cost that must be paid, but if paid, there is reason for confidence that the supply of petroleum will continue for many years and that the transitions to substitutes will be gradual and without serious shock.—Former Justice Charles Evans Hughes.

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The Guiberson bronze Sucker Rod Guide is made in sizes and styles to fit all sizes and makes of sucker rods.

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The illustration shows the design for use with Guiberson Panel-Thread Sucker Rod Couplings.

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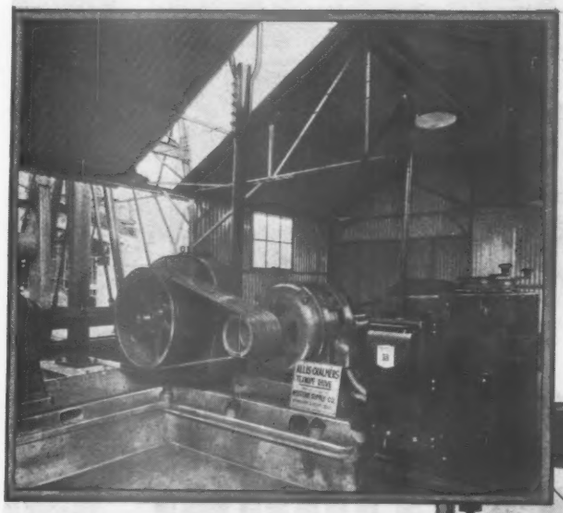

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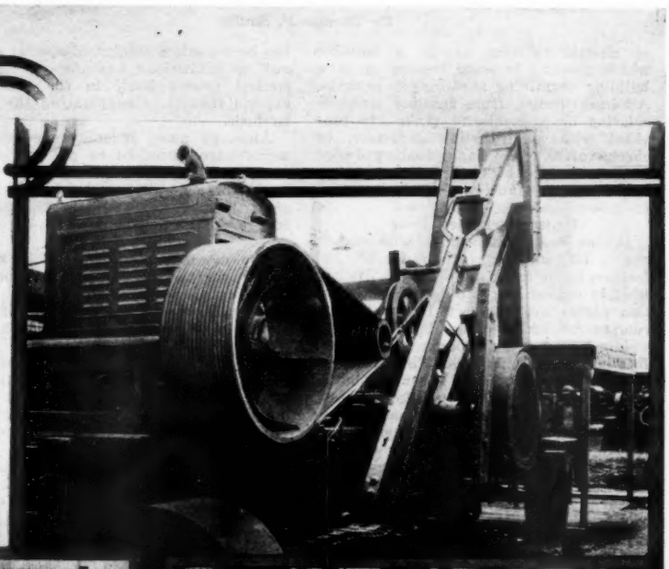
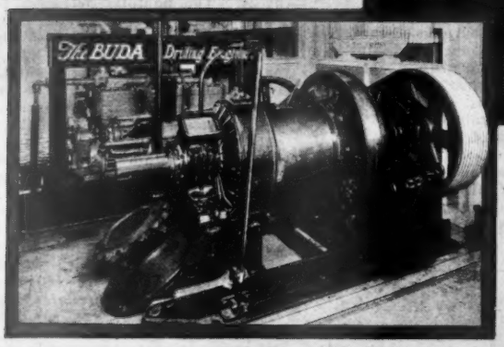
Exposition

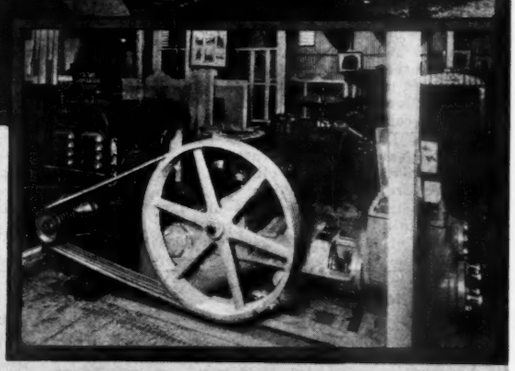
TEXROPE DRIVES

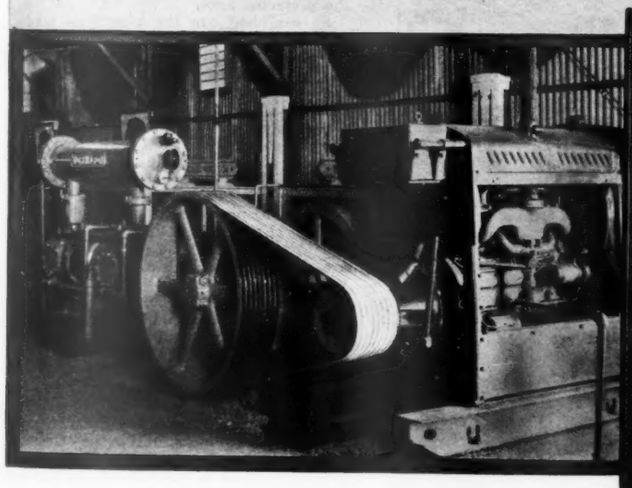
An Outstanding Feature

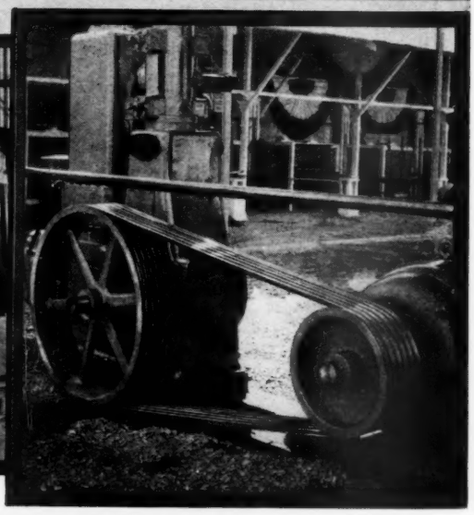
These views, taken at the exposition, illustrate a few of the many applications of Texrope Drives to equipment used in the Oil Industry.











UFACTURING COMPANY

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Trying Hard to Reduce Fire Losses

Problem Difficult Because 62 Per Cent of Oil Fires Result From Lightning. Science Makes Encouraging Progress

By Thomas F. Smiley

Definite progress has been made in diminution of fire losses which in the early days of the oil industry reached staggering proportions. What once was characterized by many as "an act of God" came to be seen as the penalty of carelessness, ignorance or foolhardiness or as a challenge to scientific research. Earnest effort on the part of the petroleum industry in the direction of reducing fire hazards and of improving methods of extinguishing flames once started has brought about a marked decrease in the losses from this source, with prospects that they will grow still smaller.

The problem of preventing loss and waste from fire has been a peculiarly difficult and discouraging one because so large a proportion of the fires are caused by lightning. Of 503 fires recorded by the United States Bureau of Mines from 1908 to 1917, inclusive, 310, or 62 per cent, were the result of lightning. Most of the recent big fires in the petroleum fields of California were from this cause.

Until the last year or two lightning, one of the most spectacular and destructive agents of nature, was regarded as virtually beyond human control. Scientific study and research within the oil industry have achieved results, however, which seem likely to bring about abandonment of former views.

Systematic endeavor to reduce fire loss and waste to a minimum has been carried on along three major lines, adoption of safeguards against the starting of accidental fires, development of more efficacious methods for extinguishing fires once started, and study and experimental work with a view of removing the menace inhering in lightning.

One need only to visit any modern oil field to recognize that the men supervising production of petroleum believe an ounce of prevention is worth tons of cure. It is noticeable that precautionary measures are directed chiefly at careless outsiders and not at the men employed, who already are imbued with the principles of safety first.

Signs Warn Visitors

The stranger approaching a drilling well, for instance, is greeted by great placards warning, "Danger," "Don't smoke," or perhaps a peremptory "Keep out." It is a matter of common knowledge that tobacco-chewing is more prevalent among oil-well workers than almost any other class of men. This grows out of the rule, voluntarily practiced in almost all cases, but sternly imposed if not, against the use of tobacco in its more popular form, smoking, about the derrick or other places in the field where fires easily might be started.

When a well is about to be drilled in the fire in the near-by boiler which has provided the needed power is extinguished and the boiler is moved several hundred feet away. Precautions are taken against possibility of gas fire through any accidental short-circuiting of electric light wires.

About refineries, storage tanks or wherever there is a fire hazard safety rules are observed.

In the modern gasoline plant extraordinary precautions are taken to reduce the likelihood of loss by fire. Buildings in which danger of explosion necessarily exists are of light construction and open easily if an explosion occurs. Thin glass is used in the windows. Buildings containing gasoline treating plants and gasoline storage tanks are at least 100 feet from the main building. No open aerating or tanks are in the same building with treating tanks or pumps handling the gasoline. All such pumps or tanks are at least 100 feet from the main building. No electric motors or generators or electric switches are in a building where gasoline is being treated or in a building containing aerating pits or tanks. All lines leading from gasoline tanks to chlorine or hypochlorite tanks are provided with acid-resisting nonreturn or check valves. No flame heating device is permitted to be closer than 100 feet to racks where tank cars are loaded with casinghead gasoline or unloaded.

Boilers 100 Feet Away

Boilers used in connection with modern gas or oil pumping stations are set 100 feet or more from the station. Boilers used in connection with casinghead gasoline plants are at least 100 feet from compressor or blending building. No welding or forging is done within 100 feet of process buildings. Fire stills are at least 100 feet from the main building. Boilers are placed on either the east side or the south side of the main engine room because of prevailing winds carrying vapors from the engine room to the boilers. Electric wires for power and light are placed in approved conduits. Vapor-proof globes are used and guards are provided where inflammable vapors are present. All equipment used in connecting or disconnecting circuits is placed outside the building or in a separate compartment. All wiring is done in accordance with the national electric code. No combustible material such as waste, rags, etc., is allowed inside buildings unless kept in a container approved by the Underwriters' Laboratories.

Notwithstanding extreme care and caution exercised, there are oil fires, just as there are fires in other industries where the unavoidable hazards are far less. Within the last few years the extinction of oil-well and gas-well fires has been made a subject of special study, and so efficacious has the nitrogelatin method proved itself in the hands of experts that it is supplanting the older methods.

Although many ingenious devices formerly were employed to put out an oil or gas fire, the one that came to be used most generally consisted in directing great jets of steam on the flame from boilers set up for the purpose.

Shooting Out Fires

The newer method consists in setting off a charge of nitrogelatin alongside the column of burning gas or oil. A recent instance of the efficacy of this method in stopping enormous loss by fire was afforded by a well of the Twin State Oil Co., in the Earlsboro Pool of the Seminole Field. The well, flowing 200 barrels of oil an hour, with a small quantity of gas, caught fire from a spark generated in some accidental manner not definitely determined.

An expert in the extincting of oil field fires was summoned. The oil, as it gushed from the tubing, was striking the oil-saver, which threw it, in the form of a great umbrella, about the derrick. The result was that the fire presented the appearance of a burning oil tank. The first step was to loosen the master gate and the control head with a charge of the gelatin. These then were removed by means of long hooks. The oil thus was allowed to spurt straight up into the air in a great column of flame.

By using steam, water and foamite, all fire on the ground was extinguished. Thirty quarts of nitrogelatin then was placed close to the column of fire by the expert and his assistants, the explosive wrapped thickly in asbestos being conveyed on an iron cart to the spot desired by the operators upon whom streams of water were played and who wore asbestos suits. The explosive was set off by an electric detonator, instantly extinguishing a fire that had been consuming 4,800 bbls. of oil a day.

This instance is typical of the manner in which fires which formerly caused losses of almost incalculable amounts, are snuffed out now with amazing promptness. It should be mentioned that the fire expert, with his nitrogelatin and his asbestos suit, frequently uses an airplane in getting to the scene of a fire.

Expert "fire shooter," in asbestos suit, approaching burning gasser.

Lightning Rod Loses Favor

The time-honored lightning rod has fallen into disfavor in the oil industry, whose scientists have developed a system of protection from lightning based on a theory diametrically opposite to the one on which the lightning rod operates.

The new device, known as the Cage system of lightning prevention and the invention of John M. Cage, of Los Angeles, Cal., already has been adopted by the Pan American Petroleum Co., which has 12,500,000 bbls. of oil protected by it. The lightning-rod seeks to protect property from lightning by guiding and controlling the direction of the flash, conducting it into the ground by a prepared path, although this controlled direction does not diminish the number or intensity of lightning discharges.

The Cage system, on the other hand, primarily protects an area, and hence all objects within that area, such as tanks, derricks, etc. It removes, according to scientists who have studied it, the danger of a lightning discharge taking place in or near the protected zone. It operates by gathering into itself the ground charges which would have existed within the protected area and returning them to the charged thundercloud by ionic discharge, so distributed in time and space that no destructive discharge can take place over or within the protected area.

So confident are the assertions made regarding this new device for lightning protection by scientists and others who have participated in or watched experiments with it that the belief is expressed that this most untamable of Nature's forces may have come under a fair measure of control at last, with resultant promise of greatly diminished fire losses.

Tanks Reasonably Safe

In the meantime, according to H. E. Newell, engineer of the National Board of Fire Underwriters, the all-steel, reasonably vapor-tight and well-vented tanks are as safe from lightning as anything well can be.

Statistics compiled by the Actuarial Bureau of the National Board of Underwriters show that the losses from fire in the oil industry from 1920 to 1925 inclusive aggregated $64,887,953. With scientists devoting earnest study to means of fire prevention and superintendents and foremen giving whole-hearted cooperation, there is reason for the expectation that the five years from 1926 to 1930 will show a pronounced decline in losses from this source.

Since 1920 the major oil companies have been giving more serious study than ever before to problems of fire prevention and fire extinction. The limitations of steam as an extinguishing agent have been determined. The adequacy of dikes to arrest boilovers has been investigated and designs to increase their efficacy in this respect have been worked out. Better methods of foam application have been established. Progress has been made in the design of vents. It is believed that the advance made along these and other lines in the effort to reduce fire losses in the oil industry will result in a distinctly improved showing.

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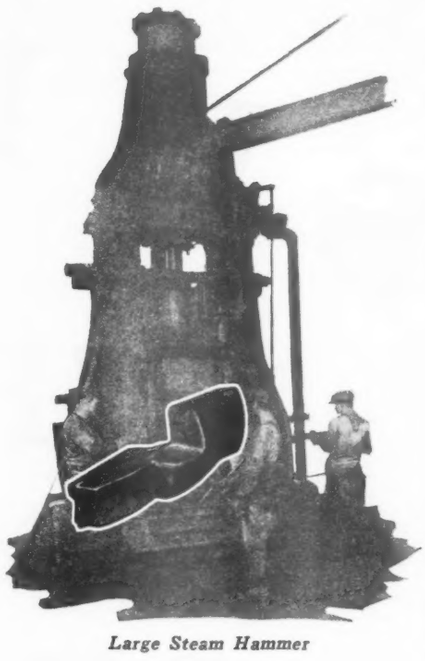

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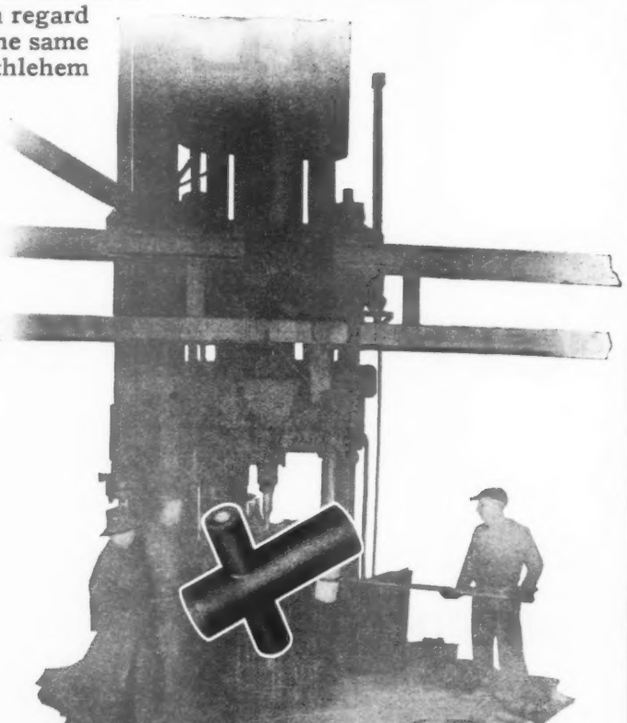

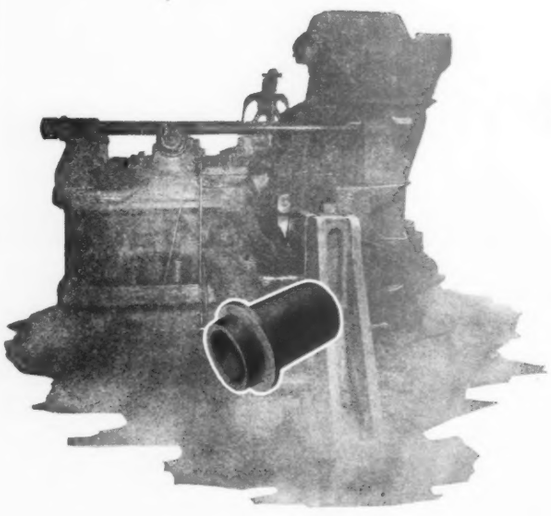

At left, Upsetting Forge Press

At right, Hydraulic Forge Press.

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Drilling Costs Increase 300 Per Cent

Expense of Putting Down a Well in 1913 Averaged $4,765 While Now Average Is $18,725. Gasoline Prices Still Low

By James McIntyre

The accompanying table of drilling costs presents some very impressive figures. They show the total number of wells completed in the first 10 months of 1913 and 1927, the cost of drilling the wells in the two years and the average cost per well in both years. The figures represent gross cost, no allowance having been made for salvage from the dry holes drilled, which in 1913 represented 18.5 per cent of the total and in 1927 28.5 per cent. In some of the States listed the increase in the cost of drilling now over 14 years ago (the year before the opening of the war in Europe) is very great. The reasons are given in the brief drilling history of states farther on in this story.

The future of the producing end of the oil business will show even greater costs as the necessity to explore new depths presents itself. Many pools will be opened in all parts of the United States in areas between already-known pools, and in present-known sands in their respective areas. The allotted span of life allowed to man has not yet elapsed since the first oil well was drilled in, and new productive spots are yet being found in some of the very old fields of the country. Therefore it may be said that it takes a lifetime to develop even so small a geographical unit as a county. But there will come the time when a well a mile deep at a cost of $80,000 or more will be a quite ordinary thing and wells two miles deep may find sufficient oil production to make them pay.

The tremendous cost of wildcat wells that must go a mile and a half into the bowels of the earth, and perhaps much farther, with a chance of a dry hole that runs all the way from 5 to 1 to 100 to 1 should accord the oil industry much thoughtful and fair consideration.

Vast Sum Needed

It will take a vast sum annually to finance the drilling of the distant future, but the industry is approaching it by swift stages. The great Seminole area with its $65,000 to $75,000 hazards in each wildcat well drilled, has only been "scratched." It is a territory 30 miles square containing 576,000 acres. It contains both semisett'ed and newly-discovered pools at this writing but they occupy only a small part of the whole territory. A large amount of work in drilling must be done to determine the possibilities of that marvelous oil region. There will be many expensive dry holes along with the successes. Yet it is only one of the several territories in the United States where drilling costs will be high, and which will greatly increase the average cost of "sinking a well."

The time has already gone by when most lone individuals can afford to take a chance on drilling a well even in favorable looking territory. The strongly capitalized company has taken the place of the firm and the individual in most cases. There are a few men and firms yet operating in the deep sand territories but they are so few that they attract attention. In the great Seminole field, Thomas B. Slick is the only individual oil producer. Mr. Slick is reputed to be very rich and is known to have unusual nerve when it comes to backing his judgment. Even among oil men, noted for their willingness to assume financial risks in their business, he is an outstanding rarity, along with those other intrepid oil men, Waite Phillips, L. H. Wentz, and a few more scattered over the oil producing states.

1860 and 1927

"I had $2,000 saved up and I lost every dollar of it drilling dry holes." An old-timer was talking to the writer some years ago about Colonel Drake's well, drilled in 1859 and which was the beginning of crude oil history as we know it. He lived in Titusville, and like everyone else in that part of Pennsylvania was intensely excited over the discovery of oil in the Drake well. Oil was found at a depth of 69 feet, and this man thought that getting rich was only a matter of drilling 69 feet, but, as he said, he lost every dollar drilling dry holes.

"How many did you drill for that sum?" I asked and he replied that he did not remember exactly, but that "you could drill a lot of them for $2,000. We kicked them down with a spring pole and some of them we drilled clear down to 100 feet."

In Logan County, Oklahoma, in 1927, 67 years after our old friend's sad experience, seven wells are being drilled in which the owners do not expect to find oil at less than 5,975 feet, and if any one of these tests is dry it will cost the owner $90,000 or more. There are about as many wells drilling as the Titusville man drilled to lose his $2,000, and if they are all dry it will cost the owners about $630,000. Now, these are extreme cases. We don't put them forward as typical of the increased cost of drilling, but they have the merit of illustrating what a change has come over the business of searching for oil.

The drilling of these seven deep test wells in Logan County was prompted by the fact that the Roxana Petroleum Corp. completed a 3,000-bbl. well near the town of Thomas in that county at a depth of 5,989 feet and the Roxana, the Sinclair Oil & Gas Co. and the Wentz Oil Corp. started the seven wells above referred to in the hope that the oil sand found by the Roxana Petroleum Corp. extends far enough to underlie the locations on which the later wells were started. There is no assurance that it does and the oil companies must spend about $135,000, or more, per well to determine the fact one way or another. If they get paying production, all well and good; if they do not they can salvage enough of their material to bring their loss down to about $90,000 per well. It will be a year or so from the time the wells were started until they are completed, as they will be sent to 6,000 feet, at least, if the drillers don't have the bad luck to "lose the hole," in one of the many ways a drilling well can be ruined.

Only a Progressive Stage

While the Logan County territory is the deepest at which oil has ever been found in Oklahoma it is regarded as only a progressive stage in deep drilling. In Nowata County, Oklahoma, the Tidal Oil Co. and others own a big property which has been producing many years from Bartlesville Sand lying less than 400 feet below the surface, and half the wells in Oklahoma are producing from sands above 2,000 feet. These wells were drilled years ago and most of the known shallow-sand territory has been completely drilled up and is now in the category of settled production. In the past 10 years the drilling has been steadily deeper and more expensive, and the largest producing field in the United States—that in Seminole County, averages 4,300 feet in depth.

Pennsylvania, Ohio and West Virginia all developed deeper sand fields following the discovery of oil in the shallower horizons from 1859 to 1886, while Kansas never became a great producing state until oil was found in Butler County at the then unusual depth of about 2,400 feet. Previous to that Kansas production had come mostly from the eastern side of the State where oil sands lay from close to the surface down to 1,200 feet. It took nearly 30 years of development work to find the big fields in Butler County and 10 years more to find the much deeper fields in Sumner County and meanwhile many dry holes were

COST OF DRILLING WELLS COMPLETED IN FIRST TEN MONTHS OF 1927 AND 1913

	First 10 Months	Wells Completed	Cost of Drilling	Av. Cost per Well
Oklahoma	1927	3,844	$124,161,200	$32,300
	1913	7,433	34,689,811	4,667
Difference		3,589	89,471,389	27,633
California	1927	1,043	58,720,900	56,300
	1913	727	29,717,368	38,494
Difference		316	29,003,532	17,806
Kansas	1927	1,148	28,413,000	24,750
	1913	1,571	3,220,550	2,050
Difference		423	25,192,450	22,700
North Central Texas	1927	3,204	27,618,480	8,620
	1913	613	3,095,060	5,050
Difference		2,591	24,523,420	3,570
East Central Texas	1927	74	2,960,000	40,000
	1913			
Difference				
West Texas	1927	752	16,130,400	21,450
	1913			
Difference				
Panhandle of Texas	1927	739	29,560,000	40,000
	1913			
Difference				
Southwest Texas	1927	743	14,860,000	20,000
	1913			
Difference				
Gulf Coast	1927	888	24,420,000	27,500
	1913	633	1,867,350	2,950
Difference		255	22,552,650	24,550
Arkansas	1927	310	3,225,000	10,500
	1913			
Difference				
North Louisiana	1927	599	6,664,890	11,110
	1913	428	2,354,000	5,500
Difference		171	4,310,890	5,610
Montana	1927	429	4,942,080	11,520
	1913			
Difference				
Wyoming	1927	306	7,038,000	23,000
	1913	78	624,000	8,000
Difference		228	6,414,000	15,000
Colorado	1927	98	3,577,000	36,500
	1913	21	115,500	5,500
Difference		77	3,461,500	31,000
New Mexico	1927	96	1,557,600	16,225
	1913			
Difference				
Eastern Fields	1927	4,016	20,288,414	5,409
	1913	8,007	21,266,592	2,656
Difference		3,991	978,178	2,853
Illinois	1927	131	720,500	5,500
	1913	1,419	6,385,500	4,500
Difference		1,288	5,665,000	1,000
Michigan	1927	250	2,250,000	9,000
	1913			
Difference				
Lima	1927	431	1,293,000	3,000
	1913	1,280	2,496,000	1,950
Difference		859	1,273,000	1,050
Central Ohio	1927	352	2,719,200	7,725
	1913	365	2,217,375	6,075
Difference		13	501,825	1,650
Kentucky-Tennessee	1927	1,044	2,610,000	2,500
	1913	211	390,350	1,850
Difference		833	2,219,650	650
Scattering	1927	11	275,000	25,000
	1913	15	210,000	14,000
Difference		4	65,000	11,000
Total first 10 months	1927	20,508	$384,004,664	$18,725
Total first 10 months	1913	22,801	108,649,456	4,765
Difference		2,293	$275,355,208	$13,960

Note: In some of the divisions no drilling is shown in 1913. Either there was none, or the wells are included in the line carried as scattering. The few scattering wells in 1927 were drilled in the South Atlantic states.

drilled in all parts of the State, some to great depth.

The first real field in Texas—that around Corsicana was a shallow sand area, the pay sands lying above 1,000 feet. This was opened 30 years ago, and 25 years passed before the deeper sand in the same region was discovered and the great Powell and Mexia Fields developed.

Story of Spindletop

One of the most noted fields in the United States is Spindletop, just outside of Beaumont, Texas. This field was opened in 1901 with a well that started at about 80,000 bbls. a day of low gravity oil. The subsequent development of that field showed the average depth of the oil sand at about 923 feet. As late as 1913 the drilling of a well in the Spindletop area at the then average depth entailed an expenditure of about $2,600. In the past year the Yount Lee Oil Co. drilled very deep and uncovered another great oil production and this was followed by even deeper drilling until 4,368 feet became an average depth and the cost of drilling a well increased to nearly $36,000 or about 14 times as much as the wells in the same area in 1913. The fields developed in the Gulf Coast since 1913 have varied in depth from say 580 feet to below 4,000 feet and recent salt domes have been discovered below 5,000 feet. It is in the Gulf Coast especially where drilling to depths never dreamed of 10 years ago is being most seriously considered. The 10,000-foot idea will eventually be tested out in that part of the country.

Such has been the history of the producing branch of the petroleum industry, and is in part responsible for the constantly increased general cost of drilling for oil. It accounts in part for the fact that the average well in United States drilled in 1927 cost $18,725 while the average drilling cost in 1913, just before the opening of the World War was $4,765 per well.

Change in Locale

Another reason for the increased cost lies in the fact that the scene of drilling operations has changed greatly in the past 14 years. States that produced no oil in 1913 are prominent oil producing states now. States that were in the early stages of their oil development in 1913 are now among the very highest among oil producing states. On the other hand, the older producing states, east of the Mississippi River, show a large net decline in operations this year as compared to 1913. On November 1, 1927, the bulk of the drilling in the United States was in Oklahoma and Texas. The cost of drilling in Oklahoma is steadily mounting. Texas operators outside the Gulf Coast are more fortunate in that thus far the great bulk of the production of crude oil has come from sands above 3,500 feet and what is regarded as the largest potential producer of oil in the country, Pecos County, in West Texas, is yielding its crude from sands between 1,000 and 1,200 feet in depth. The discovery of oil in Pecos County was no great surprise, but the discovery of what appears to be one of the greatest oil reservoirs in history at a depth of 1,000 feet was a surprise to the geologists who surveyed that field and to the operators who owned the acreage. That there are other and deeper oil producing formations in Pecos is now regarded as very possible and plans to explore greater depths are even now under way. The deep Trinity Sand underlying many counties in the eastern half of Texas will also be drilled to when needs require and the market price of crude oil warrants the hazardous investment.

Oil is where you find it, has been a common oil region expression for over half a century, and it has been found all the way from seepages at the surface down to more than 7,000 feet in California, and geologists and petroleum engineers say that oil may be found as deep as 10,000 feet and that petroleum engineering can surmount the difficulties incident to drilling to that depth when the time comes to test out the very deep formations which thus far it has not been necessary to explore. But think of the cost!

The reader may wonder how it is possible to sell gasoline in 1927 at only 3 cents per gallon more than the current price in 1913, when it cost about 4 times as much to find the crude oil. Improved refining processes and practices deserve much of the credit for making this boon to the automobilist possible. The discovery that by means of cracking processes oils down to a very low gravity can be made to yield a large percentage of high grade gasoline has helped to keep the cost to the ultimate consumer down to a very low figure.

The steadily increasing manufacture of gasoline from natural gas which results in a highly volatile product successfully used in blending with lower gravity gasolines to make a motor fuel of proper specifications, added to the straight refining and cracking of oils gives a yield of gasoline equal to 40 per cent of the total quantity of crude oil run to stills. The benefits of scientific research in the refining industry have been passed on to the owners of automobiles, farm tractors and small power plants, to a degree that no other industry can show.

Ups and Downs of Cost

The cost of drilling for oil has had its ups and downs since the birth of the industry. At the close of the Civil War, in 1865, with war-time high prices prevailing both in materials and labor, the average well in the noted Pit Hole Field in Pennsylvania cost $7,600, divided as follows: Engine and boiler, 15 h.p. delivered, $2,500; rig and cable, $750; one 500-bbl. wooden tank, $350; drilling tools, tubing, etc., $1,000; labor, fuel and extras, $2,500; incidentals, $500. This was six years after the Drake well was drilled and when the Drake well had declined in production to 5 bbls. per day. Pit Hole crude oil was selling at $2.75 per barrel at the well. The heavy cost at Pit Hole was reduced by degrees until wells in the same general neighborhood were drilled for as low as $800, and no higher than $1,500, in the late nineties.

A 1,600-foot wildcat well in the deepest part of the Bradford area in northern Pennsylvania 30 to 40 years ago cost $1,790 as follows: derrick, $300; boiler and engine, $600; 300 feet of casing at 40 cents per foot, $120; drilling 1,600 feet at 45 cents, $720; incidentals, $50. If it was a successful test 1,600 feet of tubing would cost an additional $160; a 250-bbl. tank and the torpedo or "shot," $350 more, making the whole job cost $2,140. Deducting the price of the boiler and engine which was moved to another drilling location the net cost of a flowing well was only $1,540. Over the line in Alleghany County, New York State, the cost was about $250 less because of the shallower depth. In the Kane field in Pennsylvania the cost was about $300 more than in the Bradford Field. Very few wells in the Warren and Forest County development in the same State cost over $1,000 to drill to completion. Butler and Armstrong County wells in Pennsylvania cost about the same as Bradford wells.

In Southeastern Ohio when development was at its height a number of shallow-sand fields did not require more than $450 to drill an oil well, while none of the fields in that territory showed a higher average cost than the Bradford Field. Taking in the whole Pennsylvania and Southeastern Ohio fields in their best days the average cost of drilling was $2,105 which included all material to put the well to pumping, and from which there was considerable salvage in the price of boiler and engine which were used on other drilling wells. This salvage averaged about $850. In the so-called deep-sand territory in Southwestern Pennsylvania and in West Virginia in the nineties the cost of drilling ran from $6,000 to $10,000. The holes that were drilled to a depth of 2,500 feet could be drilled and put to pumping with flow tank and all for $6,000. The same job in 1927 would cost nearer $25,000. There was some shallow drilling in West Virginia which cost no more than wells at similar depth in Pennsylvania.

Deep Drilling in Mid-Continent

The first successful drilling in Oklahoma developed the Bartlesville sand in Nowata, Rogers and Washington counties. Fortunately for the oil men of that day they started to develop Oklahoma's possible resources in this shallow-sand part of the State. The trend of production was found to be southwesterly and the field spread out, but it was found also that to drill to the same sand meant deeper drilling at a greater expense. In the course of time the Wilcox sand was discovered.

The Wilcox sand, one of the most prolific oil-bearing rock formations in Oklahoma, outcrops east of the Nowata-Rogers shallow field in the counties named, and becomes productive of oil in large volume at 2,000 feet in Osage and in Tulsa Counties west of Nowata and Rogers. It dips farther west and south until it is found at 5,985 feet in Logan County in North Central Oklahoma and at an average of 4,300 feet in the Seminole Field in Seminole County. A Wilcox sand well in Osage or Tulsa County, at 2,100 feet can be drilled for $7,000. The first Wilcox sand producing well in Logan County recently completed cost $150,000 because of its great depth. The Seminole wells cost around $63,000 without the air and gas-lift machinery.

The Bartlesville sand, which overlies the Wilcox sand in many parts of the Oklahoma Field is productive at 230 feet in depth in Rogers County. Wells at a depth about 300 to 400 feet have been producing oil for many years. To the west the sand dips until it is found at 3,150 feet at Yale and at 3,400 feet in the Ingalls Pool in Payne County. The 400-foot Rogers County wells drilled many years ago cost a few hundred dollars each; the Yale and Ingalls wells cost from $33,000 to $35,000.

Where the Wilcox sand lies at 2,000 or 2,500 feet 20 wells could be drilled for the cost of the one completed well in the same sand in Logan County and the sand can be just as productive in each of the 20 wells as in the one deep well. The same applies to the Bartlesville sand—the depth and added expense of drilling deep does not necessarily come back to the producer in added oil production. A well that can be drilled for $5,000 can produce as much oil as one that requires an outlay of $100,000.

About 20 years ago a 20-acre oil lease in the Glenn Pool, Oklahoma, was drilled to a depth of 1,100 feet at a cost of about $2,500 per well and the four wells have produced over 935,000 bbls. of oil or an average of 41,760 bbls. to the acre and 233,750 bbls. per well. The Gypsy Oil Co.'s Boston lease in the Osage Nation, Oklahoma, on which the first well was drilled in 1912, when drilling was cheap has produced 11,830,000 bbls. from 68 wells on 410 acres, an average of 173,971 bbls. to the well, while the average cost of drilling the wells did not run over $23,000 per well. The same company's Shumway lease of 160 acres in the Towanda pool, near Eldorado, Kansas, on which the first well was drilled in 1917 has produced 8,650,000 bbls. from 53 wells an average of 54,006 bbls. per acre and 163,204 bbls. per well. These wells with the sand at a depth around 2,500 feet were drilled when war prices began to ascend and the average drilling cost ran around $30,000 per well but the oil sold for war-time prices, none of it bringing less than $2.25 per bbl. and some of it taking $3.50 per bbl. while the lease was still producing largely. The famous Jackson Barnett lease of the Gypsy Oil Company in the Cushing Field in Oklahoma has produced 5,370,000 bbls. from 100 acres. The first well was drilled in 1913. Bartlesville sand wells in that part of the field were drilled for $22,000 in those days and it was one of the deepest of the then-known fields.

The above examples of large-producing properties may be matched in the Seminole Field, with the difference that the Seminole wells cost about $85,000 each to drill and equip with the air or gas lift, partly by means of which they have shown such a very large production.

Big Production in Deep Sands

The development of Kansas as an oil-producing State parallels that of Oklahoma in the matter of increased costs. For many years the drilling was in shallow territory and consequently cheap. Not until the discovery of oil in Butler County about 1914 did Kansas figure as a large producer of oil. Its average production in 1913 for the whole State was only 6,509 bbls. per day. On November 1 of this year it was 104,800 bbls. and has exceeded 120,000 bbls. per day. The deep sands in Butler, Greenwood, Cowley, Marion and Sumner Counties, all developed in the past 13 years, have made Kansas an important oil country but the cost increased as the depth increased.

In Wyoming the famous Salt Creek Field down to the second Wall Creek sand is a comparatively shallow area where drilling costs are and were relatively low, but in recent times deeper drilling uncovered the Dakota sands, in which it was found there was a large volume of crude oil. Later the deeper Lakota sand was uncovered. The wells have been shut in because of over-production but they stand as one of America's important reserves. It is estimated that the deep sands in the Salt Creek Field could yield at least 100,000 bbls. a day of high-grade oil. They lie below 2,400 feet.

Colorado produced oil from shallow shale beds for many years. Recently the major portion of its oil production comes from deep sand fields in the neighborhood of Craig and Fort Collins in the northern part of the State. Wildcatting or exploration work in Colorado is very expensive but it is being pursued hopefully in the hope of adding oil pools to that State.

California's Many Horizons

California contains many oil sand horizons. The deepest production yet found in the United States is in that State. Sands are found from 150 feet to 4,000 feet in depth in the Ventura-Newhall field; at 900 feet in Newport, but at 4,400 feet and 4,600 feet in Seal Beach, and so on. As in other states the shallow pools were developed in the earlier years at low cost while the present-day operations are largely in the deep horizons. Present-day cost of drilling in California ranges from $5,000 to $100,000 for a single well and 6,000-foot wells are a matter of routine work.

Great changes have occurred in what may be called the geography of oil since 1913. In that year 22 per cent of the oil produced in the country came from fields east of the Mississippi River. At present the production of the same fields represents less than 5 per cent. In 1913 the production of the United States averaged 680,676 bbls. per day, which is far less than the daily production of the single State of Oklahoma at this time, and in sharp contrast to the present total of approximately 2,470,000 bbls. per day. The big production of the present comes from the three states of Oklahoma, Texas and California.

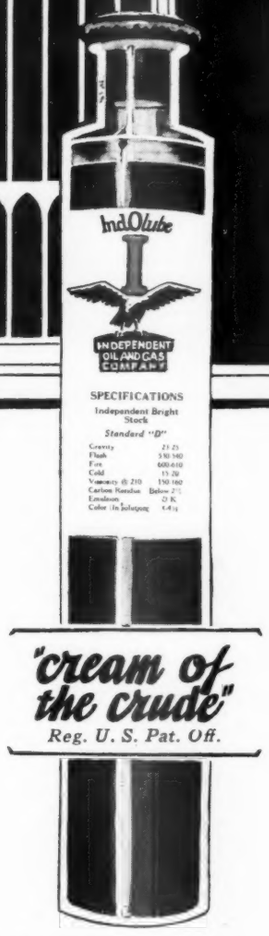
A table showing the average daily production in 1913 and the production on November 1, 1927, in the same divisions gives the following changes in the 14 years:

Production of the United States

	Av. daily prod. 1913	Prod. Nov. 1, 1927
Kansas	6,509	104,800
Oklahoma	174,190	759,500
Texas	41,122	629,217
California	267,914	624,000
Louisiana	34,243	57,143
Wyoming	6,593	51,150
Colorado	517	6,500
Scattering	30	.....
Arkansas	None	100,600
Montana	None	11,700
New Mexico	None	1,700
Michigan	None	1,300
New York and Pennsylvania	24,289	32,200
Ohio	24,059	21,000
West Virginia	31,691	18,000
Kentucky-Tennessee	1,437	19,700
Indiana	2,621	2,400
Illinois	65,461	18,650
Total	680,676	2,469,650

STATES MIGHT HELP

It may be added that if the oil-producing states desire to promote a policy of conservation, aimed at preserving the oil in the ground until it is needed, and are not disposed, or are found to be without the constitution power under the fourteenth amendment, to go to the extent of enforcing the common action of owners, or what is called the unit operation of pools, it would still be possible for them to promote voluntary co-operation, in the light of economic conditions, by qualifying or limiting the state statutes which prohibit such combinations.—Charles Evans Hughes.



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Science Employed in Search for Oil

Petroleum Industry Has Made Great Progress in Its Efforts to Insure Reserves for Future Requirements

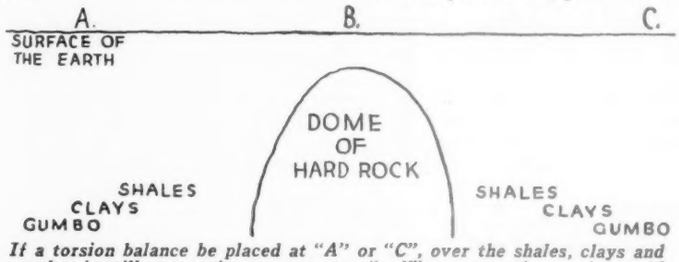
By Andrew M. Rowley*

If some of the old-time, hard-boiled drillers who would not hire any man who ever went to college and who looked with the utmost suspicion upon any person wearing a white collar who even went near an oil field, cou'd visit some of the modern oil fields today, they certainly would think the oil business had gone to the dogs. Although noted for a most expressive vocabulary and the ability to use it at all times, it is an even bet the old timers either would be speechless or too disgusted to talk if they went on the derrick floor in a field—say at Seminole in Oklahoma—and heard the driller, tool dresser and even the roughnecks earnestly discussing the Hunton lime, the Viola lime, the Sylvan shale or the Simpson lime. And if they saw a field worker take his microscope and examine samples of the formation being drilled—well, if you have ever met some of the old-timers I have in mind, you would know it would simply be a matter of carrying the old-timer away. He would pass out completely.

However, such great strides have been made, even during the past two or three years, in methods and practices employed in searching for petroleum that the importance of the science involved has made itself felt throughout the industry and drillers, tool dressers and others employed in the drilling of wells now no longer look upon geologists and other technical men as persons to be shunned. On the other hand, it is realized these men have a most important function to perform and drillers and other field men are rapidly picking up a working knowledge of geology, at least in so far as it affects the immediate area in which these field men are operating.

Scientific Improvements

Much has been written and said about the locating of salt domes through the use of the torsion balance, the seismograph or the magnetometer. Prior to three or four years ago, very little had even been heard of such instruments and very few persons in the petroleum industry knew anything about them. Yet that spirit of progress which has made the refiner junk millions of dollars work of refinery equipment in order to install something which would make a better product at less cost, and which has made the producer buy devices which prevent blowouts at his well and thereby save the oil and gas, permeated the geological and land departments of the oil companies with the result hundreds of thousands of acres of land have been tested by the torsion balance, the seismograph and the magnetometer in efforts to find new oil pools.



If a torsion balance be placed at "A" or "C", over the shales, clays and gumbo, it will not register as great a "pull" or attraction as it would were it placed at "B" where the top of the uplift is closer to the surface of the earth.

Scientific methods are being used widely by the petroleum industry in its search for new oil pools in order to insure this country an adequate supply of petroleum for all needs. While no device has ever been made which can locate definitely oil fields, the instruments mentioned above—the torsion balance, seismograph and magnetometer—aid greatly in locating places which hold promise of being oil bearing.

Briefly, petroleum geology has to do with the location of uplifts. In areas where oil may be found, this oil in most instances is held in formations which have undergone an upheaval. In other words, the most likely place to find oil is in a dome, such a dome usually being in the form much like an inverted saucer. Such domes, too, are composed of hard rocks or denser masses than formations surrounding them. Years and years ago these rock formations experienced a great upheaval and the top surface of such domes, naturally, was brought closer to the surface of the earth.

Locate Hidden Domes

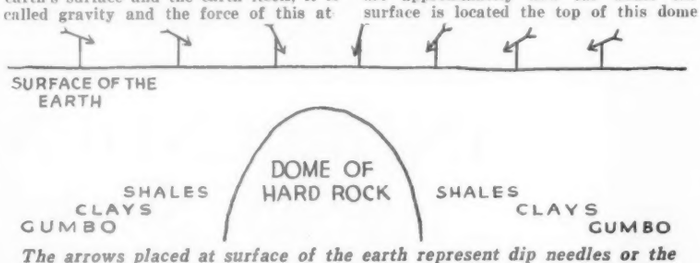
The torsion balance, seismograph and magnetometer are instruments devised by which three scientific principles for locating hidden domes or rock formations may be employed—the torsion balance embodying the principle of gravity; the seismograph the principle that sound waves travel faster through solid masses than through the air; and the magnetometer the principle that deep-seated hard rocks contain more magnetic material than softer rocks or less dense formations.

As stated, the torsion balance embodies the principle of gravity, and gravitation is the attraction of every object in the universe for every other object. When the attraction is between an object at the earth's surface and the earth itself, it is called gravity and the force of this attraction is determined by the relative mass of the two objects. It is a well-known fact that sandstone is denser than shale and that granite is denser than sandstone or limestone. Oil is found in sandstone and limestone.

The torsion balance may be thought of as a spring balance which is pulled down more when placed over a point where an uplift or dome is nearest the surface of the earth. Of course it is not a spring balance, for no spring balance could be made delicate enough to register the very slight difference in pull registered by a dome projecting 100 feet or so nearer the surface. But the torsion balance does register a greater difference in this pull or gravitation or attraction when it is placed over a dome than when it is placed at another point on the earth's surface under which the hard rocks are buried deeper than is the case where the dome is located.

Rock Attraction

The hard rocks forming the dome or uplift exert a greater attraction, which is registered by the torsion balance, than do less dense formations surrounding the dome or uplift. By placing the torsion balance at numerous points in a certain section and recording the extent of the attraction exerted at these different points, it is possible to determine the approximate location of the dome or uplift under the earth's surface and to figure approximately how far under the surface is located the top of this dome or uplift. The accompanying rough sketch illustrates this.



The arrows placed at surface of the earth represent dip needles or the principle upon which the magnetometer operates. The magnetic material contained in the hard rocks causes the needle to dip towards this material.

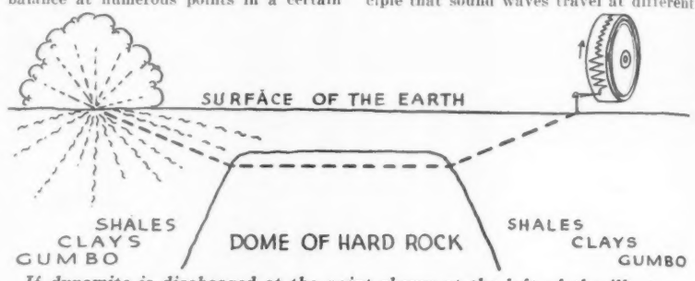
The magnetometer is like the dip needle or magnetic compass without a balance on the south end of the needle. The needle points downward towards masses of hard rock or formations containing more particles of magnetic matter than surrounding formations.

All material composing the earth carries small particles of magnetic matter. Nature has not distributed all this magnetic material equally through the earth. Certain iron ores contain a very high percentage of magnetic material, consequently, for many years, bodies of iron ore have been located by use of the dip needle. More recently it has been discovered that there is more magnetic material in hard rocks, such as limestone, sandstone, granite, etc., than in such soft rocks as clay, shale and gumbo. In the case where hard rocks have been uplifted, the attraction of the dip needle is greater at a point on the earth's surface over this dome than it is when the needle is located at a point on the earth's surface over softer formations such as clays, shale or gumbos, or where the hard rocks are buried deeper.

The magnetometer utilizes this principle and makes use of this fact in recording the attraction of buried formations. When placed directly over a hidden dome or uplift, the needle has a tendency to point directly downward. As the instrument is moved further from the point immediate'y over the hidden dome or uplift, the needle points downward at a less sharp angle and when placed at a point on the earth's surface where the hard rocks are buried far under the surface, the needle would be almost parallel with the surface of the ground. The accompanying sketch illustrates this.

Based on Sound Waves

The seismograph is based on the principle that sound waves travel at different rates of speed through different substances. Every schoolboy knows that sound travels faster through the rail's of a railway than through the air. Boys have tested this frequently by getting, say a quarter of a mile apart, and then one striking the rail with a hammer or other object. The boy a quarter of a mile away with his ear touching the rail hears the sound of the blow, through the rail, possibly a second or so before he hears the sound through the air. The same principle is involved when persons listen at the rail to ascertain the nearness of an approaching train. No sound may be heard through the air, but the rumble of the train may be heard through the rail.



If dynamite is discharged at the point shown at the left of the illustration, sound waves travel through the earth. These waves travel faster through the dome of hard rock and, therefore, reach the seismograph, shown at the right of the illustration in form of revolving drum, more quickly than do the waves traveling through the air, shales, clays and gumbo.

The denser the medium through which a sound wave travels, the faster that wave travels. Hence a sound wave travels faster through the earth than it does through the air. Also it travels more rapidly through sandstone, limestone and granite than it does through soft shales, gumbo or clay.

The seismograph is an instrument designed to record sound waves which travel through the earth. These waves have a frequency too low to be detected by the human ear. The sound wave is produced by the discharge of dynamite. The instant the dynamite is discharged the fact is recorded at the seismograph by means of radio. It is known how long it requires for a sound wave to travel from the point of discharge of the dynamite to the instrument if it travels through nothing but soft rocks, shale, clay or gumbo. Consequently, if the sound wave reaches the instrument more quickly, than had been figured, it is known that the wave traveled through hard rocks beneath the surface of the earth.

The time required for the sound wave to reach the instrument is measured by a tuning fork and a stylus moving over a revolving drum covered with smoked glass. Under the smoked glass is a roll of photographic film much like a motion picture film. As the stylus moves on the smoked glass and leaves the mark, this is registered on the film on the moving drum. The tuning fork registers the extent of the sound wave and records instantly the time that wave reaches the instrument. As the tuning fork is set in motion as soon as the dynamite is discharged, or when the radio signal is received and the vibration of the fork

(Continued on Page 208)

*The writer is indebted to Luther White, vice president, American Association of Petroleum Geologists, for assistance in preparing this article.

The Homestead Cast Steel *Refinery Valve*

Fig. 65

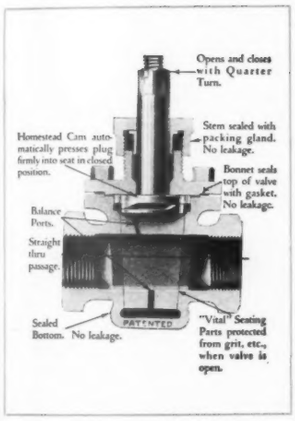
Cast Steel, Round Port, Refinery Valve for 300 pounds working pressure and 750° Fahrenheit.

Gear operated Homestead Cast Steel Refinery Valve.

Elimination Tests Established this Valve's VALUE for Service on

VACUUM STILLS

Elimination tests, during six months, by two marketers of vacuum processes, established the superiority of Homestead Cast Steel Refinery Valves for vacuum service.


Opens and closes with Quarter Turn.
Stem sealed with packing gland. No leakage.
Homestead Cam automatically presses plug firmly into seat in closed position.
Bonnet seals top of valve with gasket. No leakage.
Balance Ports.
Straight thru passage.
PATENTED
Sealed Bottom. No leakage.
"Vital" Seating Parts protected from grit, etc., when valve is open.

Result? The largest Refiner in America ordered them for two new installations.

A practically perfect vacuum is held by the deep stuffing box of the Homestead Refinery Valve. Rapid drying of the packing is prevented by cap fins that quickly radiate the heat at the 550 to 700° Fahrenheit temperatures of vacuum service.

If necessary to clean the valve and line at the same time —the full round, smooth passage straight thru the plug and body makes it easy. Moreover there are no obstructions to cause the accumulation of scale, etc.

For severe service in refineries, the Homestead Refinery Valve is unequaled, for it also incorporates the famous Homestead Quarter-Turn construction principles.

These are some refinery uses of Homestead Valves:

High pressure and high temperature services.
Acid lines
Boiler Blow-Off
Tar lines
Gas line drips
Receiving station and pump house manipulators.
Gasoline and kerosene lines.

A Single Comparative Test Will Prove These Advantages to You!

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Homestead Valve Manufacturing Company, Homestead, Pa.

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THREE WAY
FOUR WAY
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ROSS AIR SHUT-OFF VALVE
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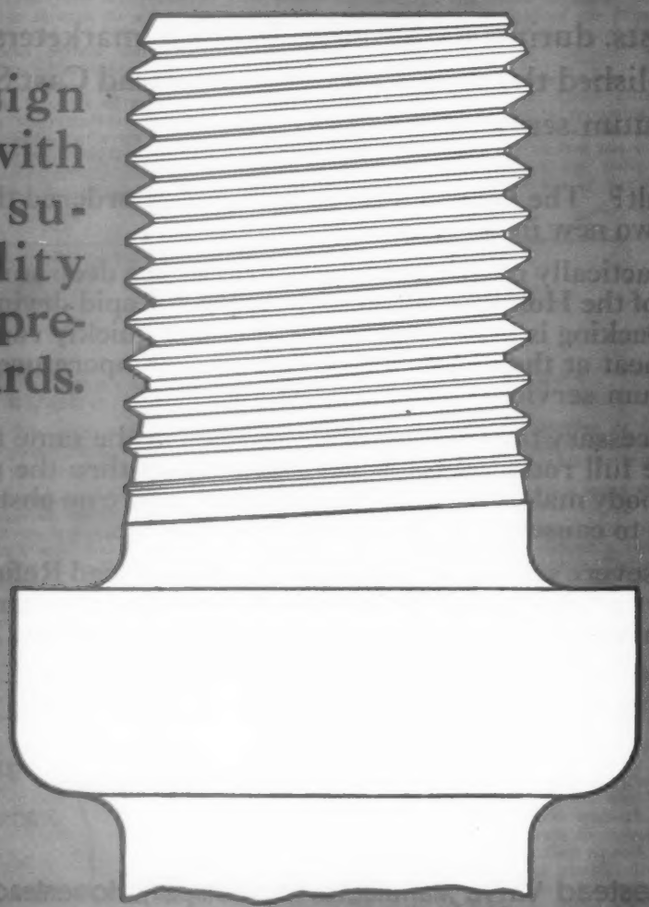

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Great Progress in Recovery of Oil

Industry's Success in Devising Methods and Practices for Producing Greater Percentage from the Oil Sands

A most important factor seems to be given little consideration in discussions to the effect that the supply of petroleum will be exhausted within a few years and because of this fact, this product should be utilized for certain requirements only. That factor is the wonderful progress made by the petroleum industry in devising methods and practices whereby a greater percentage of the oil in the sand or producing horizon is recovered.

Government officials, not long ago, made the statement that on an average only about 15 to 20 per cent of the crude oil in the producing sand was recovered. In other words, they stated that on the average from 80 to 85 per cent of the oil in a pool remained in the ground after the pool had been developed and operations to bring the oil to the surface had ceased.

Constant efforts on the part of the petroleum industry to perfect new methods of recovering a greater percentage of the oil in the ground have progressed successfully and these methods are being employed, with good results, in many areas of the United States.

It is not likely anyone would say now that the average recovery of crude in the United States was only 15 to 20 per cent of what the sand contains for it is admitted the petroleum industry, through improvements in drilling and production practices, has increased this percentage materially. Constant improvements are being made in production methods, too, so it is logical to assume a further increase in the percentage of crude oil in a sand will be recovered as the new practices prove their worth.

Vast Petroleum Reserve

However, it should be kept in mind that there has been produced in the United States since the beginning of the petroleum industry in 1859 approximately 10,000,000,000 bbls. of crude oil. This oil was recovered from fields extending from the eastern section of the United States, across the continent to the Pacific Coast. Many of these fields now are producing but a very small fraction of what they did years ago. But the limits of these fields have been defined; it is known definitely where the oil was found in them, where the sands lie, and how much these different fields have produced.

Consequently, these old fields provide a vast known petroleum reserve when methods are perfected and put in operation to recover at least a part of the oil known to remain in the sands in those fields.

If 25 per cent of the oil in all fields of the United States has been recovered and there remains in these sands 75 per cent of their original crude oil content, the fields already developed in this country would contain now 30,000,000,000 bbls. of crude oil, or three times as much as has been produced from 1859 to the present time.

Already some of the new methods devised for procuring a greater percentage of the oil in a sand are being practiced in fields formerly regarded as exhausted. Production has been increased materially through water flooding and the air and gas drive. A brief description of some of the recent improvements in production methods follows.

Repressuring

The idea of forcing gas into a "key well" to renew the pressure in the sands and thereby drive the oil out and into nearby oil wells occurred to I. L. Dunn in 1911 when he was operating old and declining properties in the Marietta Field in Ohio. With the use of a compressor he forced natural gas under high pressure into the sands and was repaid with a greatly increased production from the old wells nearby. This method is now in use in many old fields and has been greatly improved since Mr. Dunn first applied it. In some fields where no gas is obtainable for repressuring, air is used with equally good effect and in some fields air and gas are both utilized. This method of forcing oil out of the sands has resulted in the recovery of a greatly increased production wherever it is successful. Like the water drive, air-gas lift and other auxiliary methods of producing oil, repressuring with air or gas is not applicable in all fields. The water drive has proved a failure in most fields outside of the Bradford and Richburg areas, but repressuring with air or gas has been found effective in most old fields where it has been tried and its use is spreading constantly. It has met with signal success in some Kansas and Oklahoma fields. The outfit consists of a large air-gas compressor driven by an engine and a system of pipes leading to "intake wells" to the proportion of one intake well to 10 oil wells on a large closely drilled property, or one intake well to four or five oil wells, where the wells are not closely spaced. It takes from two weeks to several months for the air or gas under a pressure all the way from say 50 pounds to say 500 pounds to increase production, but once the increase occurs it maintains for a long time and recovers a vast volume of oil otherwise unrecoverable. Increases of 250 per cent in production are common under this method, which has thus far been used only where properties have reached a stage where they could be profitable only under a high market price for crude oil.

The use of vacuum to increase the production of oil and gas in old wells has been in vogue many years and in many fields. Its operation is a reverse of the repressuring method, which pushes the oil ahead while the vacuum pulls it out by suction. In some fields both systems are used, the vacuum being applied to the wells on the outside edge of the property and repressuring applied to the inside wells.

The Water Drive or "Flood"

When the water drive or "flood" was first given serious consideration in the Bradford Field, in McKean County, Pennsylvania, that field was 37 years old and had fallen off in production from a peak of 100,000 bbls. or more per day in 1881 to about 3,500 bbls. per day in 1906.

Water pressuring has increased the production of the field to 14,000 bbls. a day and the field is good for half a century more at least, according to the best engineering opinion.

Without the "flood" neither field would be worth operating now unless oil was at a very high price—say $5 per barrel. The market price in that field for crude oil at this writing is $2.65 per barrel. The average production of the wells is only .82 bbl., a matter of about 34.6 gallons per well per day. Without the flood the wells would be averaging perhaps one-sixth of a barrel per day or something like 7 gallons per well.

The "flood" was accidentally discovered about 16 years ago. Some old wells had been badly plugged after having been abandoned as no longer commercially worth operating. Water from the springs just below the surface, but from 950 to 2,000 feet above the bottom of the wells, found its way to the bottom, creating a constant pressure of hundreds of pounds per square inch against the Bradford sand. The water forced into the sand began very slowly to shove the dormant oil to the nearest oil wells that had not yet been abandoned. Increased production was noted, but for a long time no reason could be assigned to it. Then some producer advanced the theory of the water drive and upon careful investigation it was found that this was correct. Wells that had fallen to a small fraction of a barrel increased several hundred per cent in output. A 2-bbl.-a-day lease became a 10-bbl. lease and even better. Some producers took fright. They could see ruination of their property in the incursion of water and they hastened to dispose of their leases. Other, wiser, ones instead of viewing with alarm the results of the water drive, saw in it the salvation of a great field of 85,000 acres of sand with an enormous oil content, much of which would forever remain in the sand for the lack of a driving power to discharge the oil, and these bought leases so freely that properties rose in value until the 85,000 acres of sandstone buried deep under the surface had a valuation in excess of $85,000,000.

Revised the Law

The laws of Pennsylvania provided for careful plugging of abandoned wells and prohibited the "flooding" of wells with water, but McKean County producers induced the State Legislature to pass a special act permitting the "restoration of pressure in the oil sands of McKean County." By this time McKean County producers and their neighbors in New York State had devised a simple but effective means of creating a water drive, or "flood", which has since been improved and began to study means of locating wells to obtain the best results in production of oil.

Now the whole field is being redrilled with no regard to the location of old wells and for the past 18 months has been one of the most active fields in the United States, no less than 200 strings of tools being kept constantly at work when the market conditions warranted drilling.

One water, or intake well, will create a pressure that will shove the oil out of 9,000 square feet of sand. The oil wells are located 150 feet apart. In the center of four wells, occupying what may be termed a five-spot location, the water well is drilled to the bottom of the sand. A string of casing—6-inch pipe—is set, with a wall packer at a depth of say 200 feet—just below the water springs which abound in that region. The casing is perforated to let in the water. A string of tubing—2-inch pipe—is run to the bottom of the hole. An open coupling is inserted in the upper end of the tubing to admit the water and another open coupling inserted at the bottom to let the water out. The tubing is packed off just above the oil sand to exclude cavings. That is all there is to the preparation. Nature does the rest. The water from the springs enters the perforated casing and the open tubing, completely fills the hole, and puts a continuous pressure on the sands. Naturally the deeper the hole the greater the pressure. The water displaces the dead oil which is forced forward to the nearest oil well. It also releases the pent up gas, thus enriching the oil. This method has in the past year created no less than 4,750,000 bbls. of petroleum wealth that would otherwise have been left in the ground and it will create many million barrels more before it ceases to be effective.

Use of Soda Ash

An experiment is being tried in the Bradford and some other fields wherein a quantity of soda ash under solution is poured into a water intake well and the solution forced into the sand, the theory being that the solution will release the oil from suspension, and under pressure force it out of the sand and into near-by oil wells. It will be a year or two before the industry can learn whether or not the soda ash will be effective as an aid to the water drive.

The air or gas lift method of producing oil, while not new, reached its real development during the past year, notably in the Seminole Field in Oklahoma. Gas is the propelling force that makes oil wells gush, when they do. One of the most familiar and most effective conservation processes developed by the industry has been the separation and saving of the gas expelled with the oil. It had grown into the great natural gasoline department of the industry before the gas lift was developed to its present stage, the gasoline extracted from the casinghead gas at the wells adding this year 1,600,000,000 gallons of gasoline to the quantity produced by the refineries.

The idea of the gas lift was to utilize the gas expelled with the oil, adding more gas to it and, compressing it to a certain pressure, reintroducing it into the oil at certain points in the tubing or casing of the well so that it could again be employed in lifting more oil. This process of recycling the gas conserved the gas and at the same time assisted in extracting a much greater volume of oil from the wells.

Compressed air has also been employed as a similar lifting medium for oil where gas was not available.

The immediate effect of the air or gas lift is to draw more freely and heavily upon the oil in the sands. Before the air or gas lift was applied wells which ceased flowing or failed to flow were put on the pump. The air or gas lift virtually extends the flowing period by reintroducing compressed gas or air which, expanding, carries the oil up with it, causing what may be described as an artificial flow when the natural flow is exhausted.

The effective use of the gas or air lift has, of course, greatly increased the early recovery of oil which would otherwise have had to be pumped. In Seminole, for example, it has made possible a production of oil within 10 or 11 months that would ordinarily have been spread over four or five years.

Mining Oil Sands

Then there are the possibilities of recovering oil by mining as France has been doing in Pechelbronn. The process, invented by Leo Ranney, now the property of the Standard Development Co., is very simple.

A shaft is sunk to the top of the cap rock covering the oil sand, or through the cap rock and the oil sand to the lower cap rock below the oil sand.

From this shaft tunnels are driven on top of the cap rock, or just below the lower cap rock. Each of these tunnels contains a pipe line. At intervals of say 10 feet in each tunnel a 3-inch hole is drilled into the cap rock almost to the oil sand. A 2-inch nipple is sealed in each hole, a cross being screwed to the outer end of each nipple and the pipe line screwed horizontally into the cross on the two sides. In this way each nipple becomes an oil collecting branch of the pipe line.

A rock drill is then inserted through the cross into the sealed-in oil nipple with which drill a hole is made into the oil sand. When production is secured the drill is withdrawn, an iron plug is screwed into the fourth hole in the cross and the simplest form of "mine well" is complete.

Trunk lines lead to the bottom of the shaft and are connected to one large pump which pumps the whole system.

This necessarily brief summary is taken from an article by Mr. Ranney which appeared in The Oil and Gas Journal, November 26, 1925. Enumerating the features of the mining system, Mr. Ranney said it seemed to be operable under a wide range of field conditions and applicable to considerable depths where recoverable oil justifies installation. Mining difficulties expected are met and handled daily in metal and coal mines.

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DOUBLE PIN

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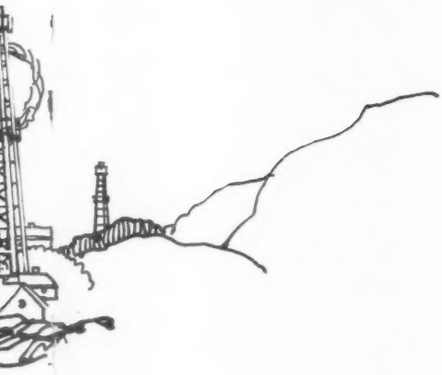

THE
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NATL. STD.
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Great Progress Made in Refining Oil

Improvements Permit 40 Per Cent Gasoline Recovery from Barrel of Oil Compared to 26 Per Cent 10 Years Ago

By W. T. Ziegenhain

Progress in refining might include a story of the development of individual pieces of refinery equipment, the improvement of the quality of petroleum products, the economies effected in the every day operation, steps taken to insure the greater safety of the workmen, etc., any one of which might cover many pages. But the index of progress is the greater yield of gasoline, consistent with its economic production. To think that 26 per cent of gasoline was made per barrel of crude oil refined 10 years ago and that within that short time refiners have improved their manufacturing operations and have installed equipment enabling them to get 40 per cent gasoline from that same barrel of crude, is sufficient to mark the progress of refining.

In terms of supply and demand it means that where we are now in a period of overproduction with prices on refined products at their lowest for many years we would instead have to limit consumption to meet present production. This applies only to gasoline, for were we forced to run the volume of crude needed to supply the gasoline at the 1918 yield figure of 26 per cent we would be deluged with fuel oil. The result would be greatly increased prices on gasoline and fuel oil would be sold for little or nothing. The progress of the automotive industry would have been retarded, this in turn would have lessened the progress of the steel industry and all associated industries.

Cheap fuel oil would mean the rapid consumption of our oil resources for inferior uses .These uses can better be supplied with fuel from the vast deposits of coal, much of which is slack and because of its geographic location is the logical fuel for certain industries. Likewise, water power must be utilized for in so harnessing the rush of the waters over a falls, none of the nation's resources is consumed.

Crude Requirements

During 1927, approximately 785,000,000 bbls. of domestic and imported crude oil will be refined in the United States. This will supply 314,000,000 bbls. of gasoline, a little more than our present needs.

If refiners were operating as they were 10 years ago we would need to refine 1,185,000,000 bbls. of crude this year or 154 per cent of that now being refined. Even with our present high rate of production we would not have sufficient oil, the deficit amounting to approximately 222,000,000 bbls. annually. It might be possible consistently to produce this additional volume of crude for a few years but it could not be done without tremendous additional investments in production and the quicker exhaustion of our supply.

If progress in refining may be judged by the increased yield of gasoline the accompanying graph showing this increase may stand as the line of progress in refining. Most noticeable, is the continuous, even progress shown yearly. Even though this progress is uniform it has been brought about by the improvement of many independent factors. Cracking has probably been the greatest factor in increasing the volume of gasoline made from each barrel of crude. The rapid strides taken by the natural gasoline manufacturers are equally important. The lesser evaporation losses, both in the field and in the refineries, has been the third great factor.

Sources of Gasoline

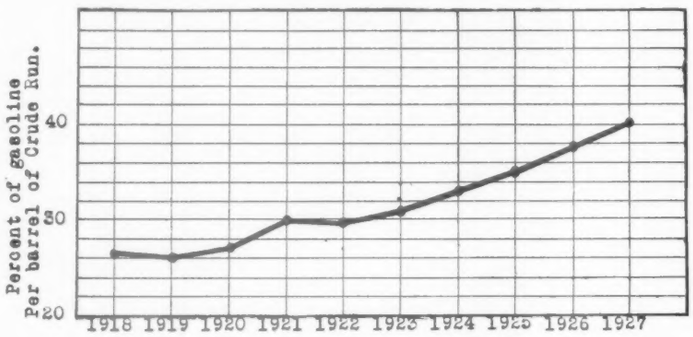
At present approximately 62.5 per cent of the gasoline used, comes direct from the crude oil, 22.5 per cent is made by cracking heavy oils and the balance, or 15 per cent is being supplied as natural gasoline extracted from natural gas. Wonderful developments have been made in each of these three distinct fields and there is no apparent limit of what might be accomplished ultimately.

The batch type of operation has long become obsolete, except in cases where special oils are manufactured. Instead, the batteries of continuous stills operate day after day producing uniform products at one-half the expense in fuel and labor. Pipe stills have been added, reducing the fuel consumption to a minimum and in many cases doubling the capacity of the plant at a small part of the cost of the original installation. Improved towers and condensing units have made the closer separation of the products possible, thus eliminating rerunning.

All of these things collectively have made possible the lesser operating costs, directly reflected in the lower cost of gasoline. Less labor is required with these changes also and the job is made easier for those attending the equipment for most of the control work is automatic. This guarantees high quality standards along with cheapening the production cost.

Rapid Expansion in Cracking

In the field of cracking, progress has been so rapid it would be impossible to trace the developments over this same period. Ten years ago a cracking unit made from 150 to 250 bbls. of gasoline a day and they were few in number. Now a single unit produces four times this amount. Likewise, the cracking plant is a part of almost every refinery. By building bigger and simpler equipment, the units are able to handle more raw oil and operate over a greater period of time.



Graph showing percentage of gasoline recovered per barrel of crude oil refined. Includes gasoline from crude oil direct, gasoline made by cracking heavy fractions and natural gasoline blended at refineries.

Improvements in the operation allows the gasoline to be made direct, thus eliminating the expense of rerunning. The gasoline made is improved in quality and is often preferred to the gasoline made from crude oil direct because of its generally higher antiknock properties. The fuel oil produced was at one time considered inferior to the fuel made by topping and some refiners equipped with cracking units once found it difficult to sell cracked fuel. Now this fuel is being sold at a premium because of its low cold test and lower viscosity, as the carbon troubles which once proved a problem have been removed by improvements in operation.

Natural Gasoline Manufacture

The same progress has been seen in the manufacture of natural gasoline and the rate of progress might have been faster. To see examples of the progress in this field one would need only to review the tremendous strides taken in the last year with respect to the expansion of the industry in the Ventura Field in California and in the Seminole Field in the Mid-Continent.

Just one year ago the first natural gasoline was being produced in the Seminole Field and today the production is near 100 cars a day. Now this field alone produces the equivalent of 20 per cent of all of the gasoline made by the 42 refineries operating in Oklahoma. To have accomplished this in a year typifies the quickness with which the industry meets the needs and is the result of an almost complete standardization of equipment and operation.

This tendency toward standardization is seen in all branches of the industry as well and where the refiner and natural gasoline manufacturer once planned and built his equimpent according to his own ideas, he now moves in equipment already fabricated and perfected, the product of an experienced equipment manufacturer, specializing on one phase of refinery operation.

This supplies him with the latest improvements immediately and at a cost much below that of developing his own equipment to the same point of perfection. This tendency is not only seen in the equipment incident to the manufacture of gasoline but is applicable to all refinery equipment, particularly in the manufacture of lubricating oils.

Lubricating Oils

Changes in the manufacture of lubricating oils are numerous and although slow to be adopted just now, promise to be of greater importance during the next few years. Vacuum distillation and the adoption of centrifuges for the separation of wax is allowing refiners to get greatly increased yields along with an improvement in quality. Improvements in the methods of treating, and filtering have cheapened the cost of production and more specifically, this saving may be attributed to the continuous treater, contact filtering and improved burners enabling the filter earth to be revivified many times before being discarded.

The story of the progress in refining would not be complete without mentioning the many different products made from petroleum. Specialties such as the hundreds of compounded lubricants for use in all kinds of machinery, under thousands of varying conditions, transformer oil for the protection of electrical equipment, medicinal oils, absorption oils, etc. Petroleum is also directly serving as the base product in the manufacture of the higher alcohols and hundreds of their derivatives as well as chemicals produced from the acid tars.

Antiknock Motor Fuels

For the immediate future, the most important problem appears to be the development of sufficient and effective antiknock motor fuels for use in the high compression motors. Already the supply of these fuels is considerably in excess of the demand and the present supply could be easily doubled were the needs present. The development of chemicals which may be mixed with the gasoline has guaranteed the adequate supply of these fuels were no other means found to produce them but antiknock properties are found in natural gasolines and are pronounced in cracked gasolines. Crudes in various parts of the country yield gasolines which have high antiknock values.

Vapor phase cracked gasoline is said to have antiknock properties in excess of present needs and this field is being given much attention. The refining industry will solve this problem and will keep one step ahead of it as has been the case in the past.

OIL STILL IN GROUND

I do not think I exaggerate when I claim that the extracting of more oil from the oil sands is today the major problem facing the industry. Here is a vast reserve of oil already defined, and awaiting but the ingenuity of man to make it available. From the porous rocks in which it is held like water in a sponge, the natural force has been depleted, and the remaining oil lies dormant in the rock for want of an expelling agent. In the past, the oil man has tacitly assumed that the declining yield of his wells meant the exhaustion of the oil itself, whereas we now know that it is not the oil that is exhausted, but only the natural gas which was the principal agent for forcing the oil out of the sand and into the well. Between the wells, some four to nine times as much oil remains as has been pumped to the surface. Nature provided only enough gas to expel a minor part of the oil and artificial forces must now be applied to extract the remainder. Until recently, our attitude was comparable to one who purchased an automobile with a tank full of gasoline, and then abandoned it as useless when this original supply of fuel was used up.—James O. Lewis, petroleum engineer.

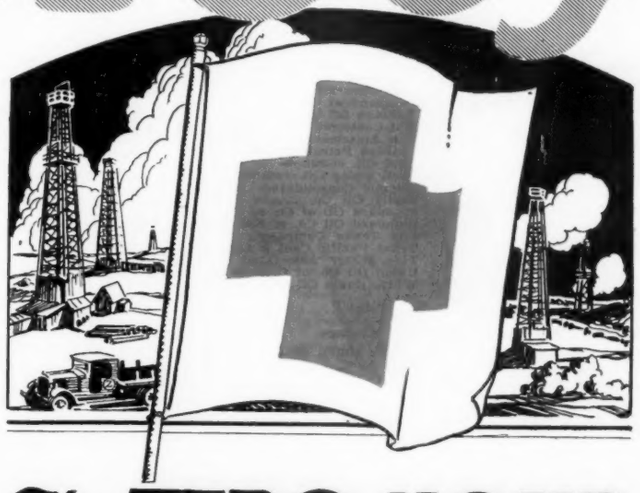
SHOULD PERMIT CO-OPERATION

If Congress were seriously to enter upon a policy of conservation, with the intention of preventing overproduction while still observing the constitutional limits of its authority, it might find it advisable to consider, as a part of such a policy, the advisability of permitting co-operation among the owners of oil fields, but always under appropriate and adequate governmental scrutiny, to the end that these owners might not be stimulated to undue haste and a wasteful competition in the development of their properties and trade, but might have a greater liberty to consult the economic conditions of the industry from time to time.—Charles E. Hughes.

OIL THAT MAY BE MISSED

At Pechelbronn, France, 15 miles of galleries have been driven through the oil sands, and it has been ascertained from large-scale operators that only 14.3 per cent of the oil had been recovered by the wells, that an additional 43 per cent is being recovered under commercial conditions by drainage into the galleries, leaving another 43 per cent in the rock. Near Hanover, Germany, under conditions paralleling those of the salt domes of the Gulf Coast, the recoveries from wells was but 13.7 per cent.—J. O. Lewis.

safety



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The ZERO HOUR BOMB *protects* OIL WELL INVESTMENTS

The average cost of an oil well is around $35,000. Whenever any uncertain and unreliable detonating device is run into any well in an attempt to explode a shot, the entire investment in that well is endangered.

Shooting hazards due to dangerous detonators are *unnecessary*. The Zero Hour Electric Bomb takes the risk and uncertainty out of oil well shooting by putting off any shot *safely* and *surely*.

This bomb is so designed and constructed that it will NOT explode before the time for which it is set to explode. And it WILL put off the shot under any conditions of heat, pressure or magnetic influence, or when buried (with the shot) under cavings.

Operators nowadays realize that it is not sound business to attempt to use any detonating device which may damage or entirely ruin a well through premature explosion, or which may cause costly delay through failure to put off the shot. A large number of the major companies now specify that *every* shot in *every* well MUST be put off with a Zero Hour Electric Bomb.

Other operators and men who are responsible for the safety of wells can get an idea of the dependability of the Zero Hour Bomb from the fact that it has been used to put off successfully more than 4,000 shots.

Zero Hour Electric Bombs can be obtained through all principal torpedo companies.

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Electric Bomb

High Cost of Overproduction Shown

Has Cut Deeply Into Profits of the Industry. General Decline in Prices and Depreciation in Values

By N. O. Fanning

Overproduction of crude oil in the United States has cut deeply into the profits of the petroleum industry. Facing the year 1927 with optimism, despite mounting production in the Seminole Pool, the industry ran into the greatest flood of oil it has ever witnessed, largely as a result of the continued increase in Seminole output and the opening up of new fields in West Texas.

The unfavorable effect on the profits of oil companies from this overproduction results directly from the decline in prices of crude and refined oil, ranging from 10 per cent to 50 per cent. Lower prices have been offset only partially by increased sales, as shown by financial reports of oil companies for 1927 so far issued.

Three outstanding indications of the unfavorable aspect of the oil business this year from a financial viewpoint are a decrease of $24,480,829, or 35.9 per cent, in net profits of 17 representative companies; a drop of $591,465,936, or about 24.2 per cent, in the market value of the securities of 20 representative oil companies whose stocks are listed on the New York Stock Exchange, and last, a flood of $360,888,035 new financing accomplished by petroleum companies so far this year.

Decline in Earnings

In the matter of earnings, most of the larger oil companies do not issue quarterly or semiannual reports, so that it is impossible to use the results obtained by only 17 concerns as indicating more than the trend of earnings for the year. It is generally conceded, however, that the largest oil companies have suffered this year, from the viewpoint of earnings, in as much as their business has had to be conducted on the same basis of low prices as the concerns which have issued statements.

The following table shows the net earnings after all charges, except in cases noted, of 17 prominent oil companies, for the first six months of 1927 and the first six months of 1926:

	Six Mos. Ended June 30 1927	1926
California Petroleum	$ 941,115	$ 3,578,065
Pennok Oil	43,099	179,942
Skelly Oil	821,597	3,106,458
Transcontinental Oil	*140,687	*388,836
Mid-Cont. Petroleum	4,884,955	6,816,884
La. Oil Refining	261,563	*1,103,639
American Republics	132,117	1,093,771
Phillips Petroleum	†11,628,873	†14,201,016
Tex. Pacific C. & O.	†1,346,872	†1,998,646
Barnsdall Corp.	1,642,683	3,153,817
White Eagle O. & R.	†1,090,694	1,344,692
Union Oil of Calif.	5,600,000	6,200,000
Indian Refining	20,642	307,864
Pan Amer. West. Pet.	163,814	1,627,118
Pan American Pet. & Transport	10,861,200	15,335,616
Tide Water Oil Co.	2,638,456	2,848,218
Associated Oil Co.	1,331,475	4,836,089
Total	$43,549,842	$68,030,671
Decrease	$24,480,829	

*Before taxes. †Before depreciation and depletion.

Depreciation in Securities

The course of oil securities has equally revealed the downward course in oil profits. Individual issues listed on the New York Stock Exchange showed declines of from 8.8 per cent to 42.3 per cent from the high prices reached early this year. As usual, the industry entered the new year with high hopes, and securities were rising in reflection of this. However, the precipitate decline in crude oil prices, beginning in February, finally resulted in heavy liquidation of oil stocks.

Taking the quotations of 20 representative listed issues as a basis for figuring, oil stocks have declined this year about 24 per cent, compared with the peak prices registered this year.

The 20 issues listed in the table below show an aggregate market decline of over a half million dollars—the actual total being $591,465,936.

Stock—	1927 High	Oct. 22, 1927	Per Cent Loss	Ttl. Market Depreciation
Amerada Petroleum Corp.	48	30	21.1	$ 6,512,000
Atlantic Refining Co.	131	115	12.2	8,000,000
Barnsdall "A"	35	22	37.1	13,000,000
California Petroleum Corp.	37	22	33.3	21,779,263
Independent Oil & Gas	33	23	30.3	4,999,000
Marland Oil Co.	59	34	42.3	57,926,475
Mid-Continent Petroleum Corp.	39	27	30.7	16,289,532
Pan American Petroleum "B"	66	48	27.3	42,371,190
Phillips Petroleum Co.	60	40	33.3	48,141,640
Pure Oil, common	33	26	21.2	21,268,590
Shell Union Oil, common	32	25	21.9	70,000,000
Sinclair Consolidated	22	16	27.3	27,056,880
Skelly Oil Co.	37	27	27.0	10,936,690
Standard Oil of Co. of California	61	55	9.8	75,564,588
Standard Oil Co. of New York	34	31	8.8	50,429,793
The Texas Company	58	51	12.1	46,060,000
Texas Pacific Coal & Oil Co.	19	13	31.5	5,068,824
Tide Water Associated	19	16	15.8	14,359,437
Union Oil Co. of California	57	44	22.8	49,252,034
White Eagle Oil & Refining Co.	27	22	18.5	2,450,000
Total	..	..	*24.2	$591,465,936

*Average.

The sharp decline in petroleum securities is looked upon, however, as more than a passive indication of the belief in the seriousness of the petroleum situation. It also has meant losses to investors who had hoped that the national prosperity would be shared by the oil business.

The above table shows the 1927 high prices of 20 leading oil securities listed on the New York Stock Exchange with prices as of October 22, percentage of losses of each issue, and the total market depreciation based on the total number of shares outstanding (fractions are eliminated in prices for the sake of clearness):

New Financing Required

In another financial way the depression in the petroleum industry has manifested itself, perhaps more acutely than in any other. That is in the heavy volume of new financing by oil companies since January 1. Leading companies have accounted for a total of over $360,000,000 new stock, note and bond issues.

This new money has gone into the industry partly for the purpose of enabling the industry to tide itself over a period of low prices. The pressure of new issues, however, has sorely tried the investment public which has patiently watched a steadily declining market for oil securities.

The following table shows the principal new financing accomplished by oil companies since January 1, 1927:

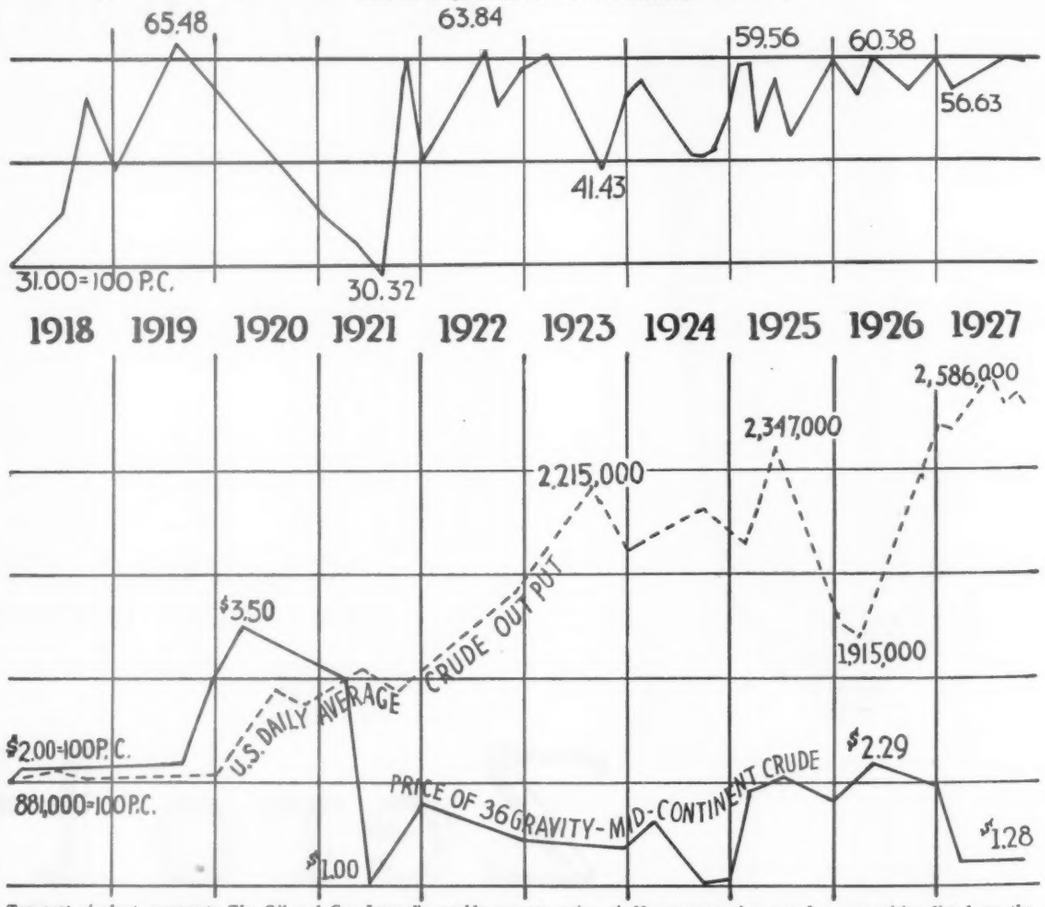
New Financing, 1927

Company and Type of Security—	Par Value Amt. Issued
Gulf Oil Corp., bonds	$ 35,000,000
Carib Syndicate, stock	587,500
California Petroleum, debentures	8,000,000
Bataafsche Petroleum, debentures	25,000,000
Skelly Oil, debentures	15,000,000
Calif. Eastern Oil, bonds	7,500,000
Calif. Eastern Oil, debentures	5,000,000
Humbls O. & R., bonds	25,000,000
Independent O. & G., debentures	6,500,000
White Eagle O. & R., bonds	5,000,000
Warner-Quinlan Co., debentures	2,500,000
Shell Union Oil, debentures	50,000,000
Empire O. & R., bonds	30,000,000
Phillips Petroleum, debentures	40,000,000
Empire Gas & Fuel, notes	18,000,000
Marland Oil, notes	30,000,000
Reiter-Foster Oil, stock	800,535
Pure Oil, notes	20,000,000
Pure Oil, stock	5,000,000
Sinclair Consolidated, bonds	20,000,000
Continental Oil, debentures	12,000,000
Total	$360,888,035

The above table does not include financing by the natural gas industry, which has been large. However, the gas industry has not suffered as has the oil industry. Gas financing has been principally for purposes of expansion.

Still another unfailing indication of depression in the oil industry is the examples of reducing or passing of dividends.

The Prairie Oil & Gas Co., one of the leading oil storing and purchasing companies, passed its dividend in October. Marland Oil Co. passed its dividend early in the year, and the Mid-Continent Petroleum Corp., which had inaugurated dividends early in the year, also discontinued payments recently. The Tide Water Associated Oil reduced the dividend, and cuts were initiated by several other companies, including Continental Oil.



Top part of chart represents The Oil and Gas Journal's weekly average price of 20 representative petroleum securities listed on the New York Stock Exchange. The lower part of the chart shows the close relationship existing between production and crude oil prices. As production increased beyond requirements prices dropped, and as consumption became greater than production, the demand resulted in higher prices. That the law of supply and demand applies absolutely in the petroleum industry is demonstrated in this fluctuation of price with production.

Tulsa the financial center

(Tulsa Tribune Nov 7, 1927)
Tulsa Bank Handles Major Stock Issue Alone for a Record
First Trust Underwrites $4,200,000 Financing Program of I. O. & G.
For the first time in oil and banking history a major stock issue has been underwritten by a Tulsa financial institution.
The First Trust & Savings Bank of which Waite Phillips is chairman of the board and Col P J Hurley, president, has underwritten an issue of 150,000 shares of treasury stock of the Independent Oil & Gas Co. it was said at the bank today.
The new issue will be offered independent stockholders of record December 22 at $28 per share. The right will be held open until December 12
$4,200,000 ISSUE
That makes the new financing total $4,200,000 It was understood today that there had already been a heavy subscription for the shares.
The First Trust and Savings is closely connected with the First National Bank, of which Grant R. McCullough is chairman of the board and R. P Brewer president, and these bank officials had parts in completing the first transaction of this character in the city's history
(Tulsa World, Nov 15, 1927)
METROPOLITAN TULSA
The announcement has been made that the First Trust and Savings Bank has underwritten a $4,200,000 stock issue of the Independent Oil and Gas Company.
The importance of the matter is that for the time a financial transaction of major importance has been carried out entirely through a local bank institution.
Heretofore it was assumed that any big money matters must be handled through New York or Chicago. Tulsa now steps forward as a metropolitan money center
This is the beginning of a new era in Tulsa banking. It demonstrates that Tulsa is not only the Oil Capital of the world, but the money center of the southwest.
The biggest town in any county is the money center of that county. The biggest town of any state is the money center of that state And the biggest town of any section of the country is the money center of that section.
The importance of the matter is at once seen when stated in a different way
The biggest city of any section is the money center of that section.
When Tulsa became the financial center of Oklahoma, it was not long until it became the largest city in the state. When it has become the financial center of the southwest, it will not be long until it becomes the biggest city in the southwest.

When Hudson first set foot on the site of New York, could he have foreseen the great Wall Street and the House of Morgan to make New York the financial center of the world? When La Salle first stood on the shores of Lake Michigan, could he have foreseen the great packing industry or the House of Strauss to make Chicago one day the financial center of the Western United States? Or when Byrd drilled the first oil well in Oklahoma, did he possibly realize that in a few short years the First Trust and Savings Bank would underwrite a four-million stock issue to presage Tulsa as the great financial center of the Southwest?

A financial institution renders its greatest service to business and commerce only when it is able to assume fully the financial needs of its home industries. The First Trust and Savings Bank has initiated a new era of service to the Oil Industry. It has blazed the trail for a financial metropolis in a state only twenty years old—in a section that has, in a few short years, converted its cattle trails into paved highways—that has multiplied the first oil well into 60,000 producing wells, releasing billions of dollars into the safe keeping of its banks. Okahoma expects the complete service that her banks are designed to give. The First Trust and Savings Bank is ready to give this complete service as a banking institution of pre-eminence and strength.

FIRST TRUST & SAVINGS BANK

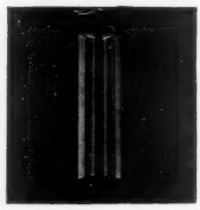
AFFILIATED WITH

THE FIRST NATIONAL BANK

TULSA, OKLAHOMA

RESOURCES EXCEED $30,000,000

The Simplest Clamp with the C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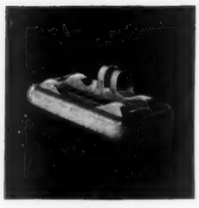
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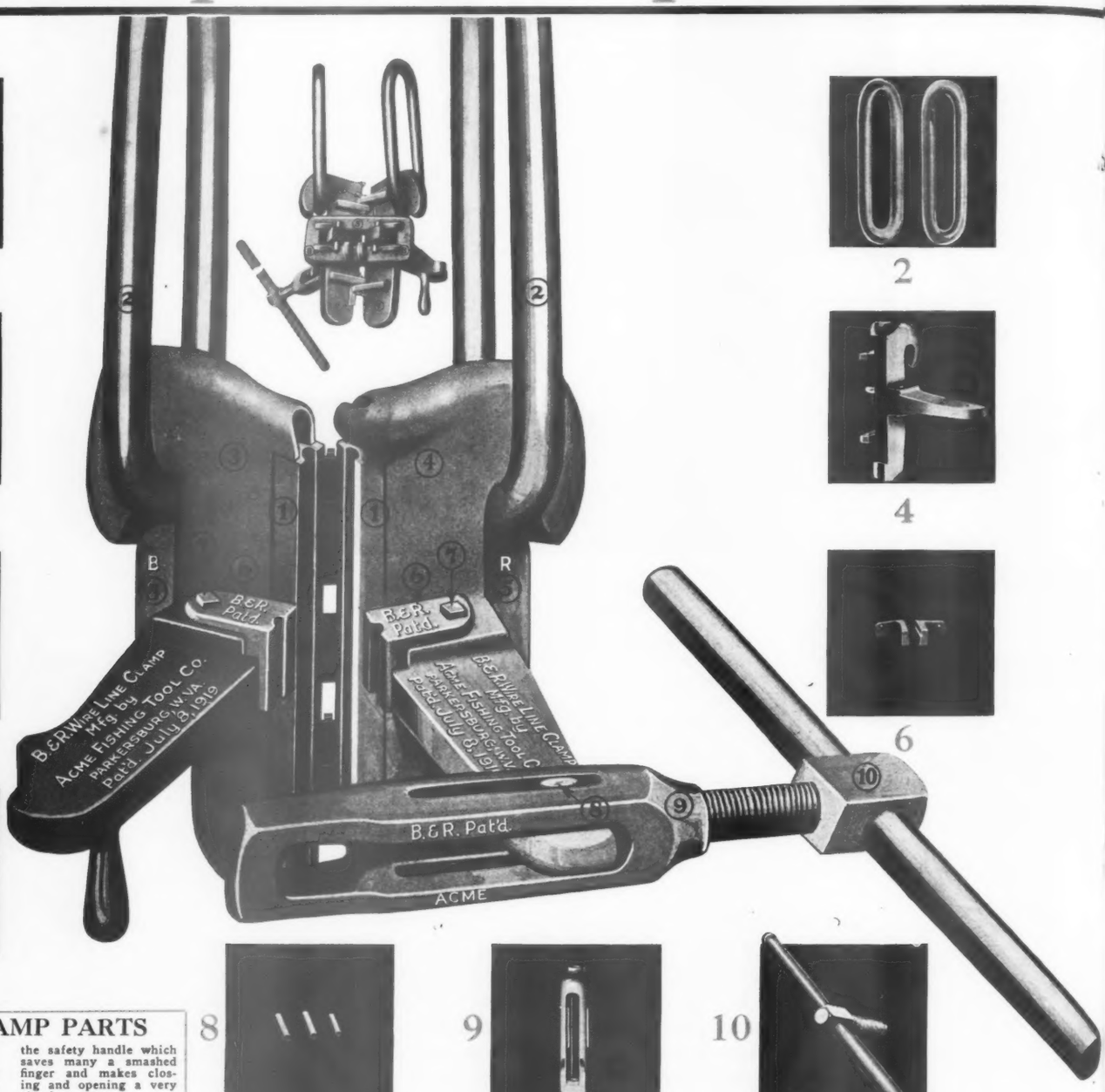

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B & R CLAMP PARTS

1

SLIPS — (for liners) — Deep grooves for cable; held in place by dovetail design — not set screws; easily removed; interchangeable; only part of the clamp that wears; extra sets of slips for any size line carried in stocks conveniently located.

2

LINKS—Special titanic design giving large factor of safety; all links are forged; no link has ever been broken in service.

3

Left hand ARM — Note the safety handle which saves many a smashed finger and makes closing and opening a very simple matter.

4

Right hand ARM — Holds clevis and Tee screw which slides freely on Clevis Pin. By simplicity of arrangement clamp can be closed and locked with one hand. Finger at top keeps the line true while hitching on.

5

BACK LINK — Designed rugged enough to give balanced strength to the entire clamp.

Three Chief ACME Characteristics

Quality — of the best; the result of 25 years of Fishing Tool designing, manufacturing and actual operation testing.

Service — Complete Stocks; Accessibly Located with competent wide awake distributors with whom doing business is a pleasure.

Value — Unexcelled on account of economical manufacturing and fair prices scientifically based on the average length of tool life.

The B & R Wire Lin

e Greatest Gripping POWER

This Clamp is Insured for your protection

B & R Clamps are sold on an insurance plan that only the very highest quality would permit.

We will replace or exchange any part broken within 90 days from date of purchase, absolutely FREE and pay the cost of freight delivery.

B & R Clamps Don't Break

For Quick Delivery Mail This Order to the Nearest Acme Distributor.

B & R CLAMP PARTS

6

SLIP RETAINERS — Are an additional set of Slips; make it possible to grip the sand line and cable at same time; valuable time-saver when desired to run a bumper or knock the tools loose. Also handy to hitch onto the sand line to jerk the bailer loose.

7

BOLTS—Two long bolts serve to hold slip retainers securely in position; two short bolts connect arms at rear of clamp and act as hinges upon which the Clamp swings open and shut.

8

BACK CLAMP PINS AND CLEVIS PIN—Two pins hold the arms securely to the Back Link, yet provide flexibility of arm movement without sacrifice of strength or rigidity.

9

CLEVIS — Perfectly tapped — permitting Tee Screw to work with ease. Heavy and Strong to withstand all shocks encountered in drilling.

10

TEE SCREW — perfectly threaded; generous handle; transmits a gripping leverage to the slips in the ratio of ten to one.

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Acme Tool Co.—Pyote, Texas.
Midland Iron Works—Billings, Montana.
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Elms Bros. & Co.—Waynesburg, Pa.
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Please send me from your nearest stock ..... sets of B. & R. Wire Line Drilling Clamps with liners for ..... inch line. This order is given with the understanding that any part or parts that break, within 90 days from date of purchase, will be replaced or exchanged without cost to me.

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ine Drilling Clamp

Many Wells Start With Small Output

Nearly 67 Per Cent of Completed Wells in Seven Years Were Either Dry Holes, Gas Wells or Small Producers

By James McIntyre

Nearly half the oil wells drilled in the past seven years in all the fields east of California have started at less than 25 bbls. production the first day. Only 12.8 per cent started between 26 and 50 bbls. and only 6.1 per cent did as well as 75 bbls. and 5.9 per cent started between 76 and 100 bbls. per day.

The wells that ranged in initial or first day production between 1 bbl. and 100 bbls. inclusive, represented 73.6 per cent of all the oil wells completed in the years 1920 to 1926 both inclusive. This year's figures, obviously, cannot be prepared until after the close of the year, so the seven previous full years are given.

With the small wells out of the way it only leaves 26.4 per cent of the oil wells to deal with. The 101 to 200-bbl. wells represent only 9.7 per cent of the whole number; the 201 to 300-bbl. wells, 4.6 per cent and the 301 to 500-bbl. wells, 4.2 per cent.

We have disposed of 92.1 per cent of all the oil wells completed and have yet to come to the big wells. A well of from 500 to 750 bbls. a day in initial production is a good well in most any field in the United States, but of this kind we had only 1.9 per cent in the seven years and of the 751 to 1,000-bbl. sort, only 1.8 per cent.

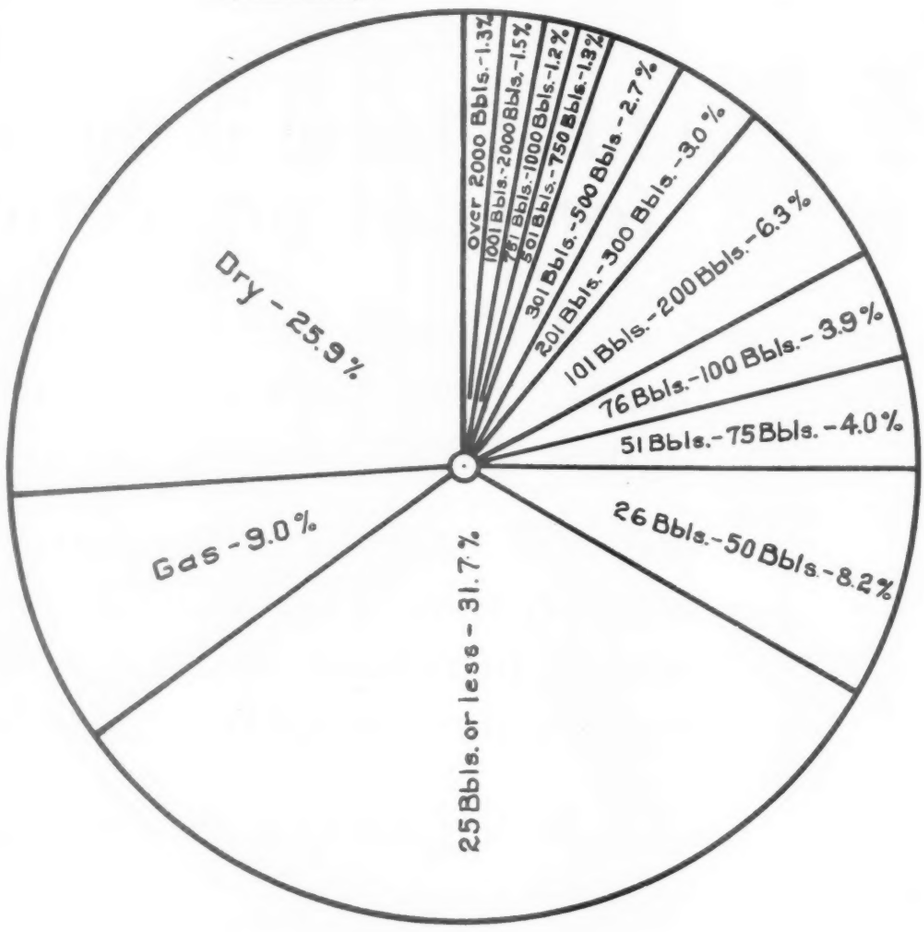
Now we arrive at the gushers. They run higher than 1,000 bbls. in initial production. Those between 1,001 and 2,000 bbls. were only 2.3 per cent of the total and the very big ones, from 2,000 bbls. up represent 1.9 per cent.

There were 113,396 oil wells completed in the seven years; 15,756 gas wells and 45,164 dry holes, a total of 174,315 completed wells.

There are men outside the oil business who have a pretty fair idea of its ups and downs; its trials and troubles; its joys and its disappointments, but there are more who know little about the business aside from the fact that they have to pay as much for a hair cut as they do for sufficient gasoline to take them on a 50 to 75-mile pleasure trip. This great majority believes that wells drilled for oil are either gushers or dry holes. They have heard of both, but what they don't know is that only 19 out of 1,000 oil wells are in the 2,000-bbl. class or better, and that only 43 out of every 1,000 wells drilled start off better than 1,000 bbls. a day.

Statisticians for the Mid-Continent Oil & Gas Association have made a seven-year survey of The Oil and Gas Journal's monthly detailed report of wells completed east of California. This report, the only one of its kind published, gives the name and location of every well completed, the serial number of the well and the farm name, the dry holes, the gas wells and the initial production of the oil wells, that is, the production in the first 24 hours after the completion of the well. The statisticians classified the wells in the order given above so that

(Continued on Page 208)



174,316 Wells = 100%

45,164 Wells	- 25.9%	- Dry	10,961 Wells	- 6.3%	- 101-200 Bbls.
15,756 "	- 9.0%	- Gas	5,159 "	- 3.0%	- 201-300 "
55,333 "	- 31.7%	- 25 Bbls. or less	4,776 "	- 2.7%	- 301-500 "
14,461 "	- 8.2%	- 26-50 Bbls.	2,202 "	- 1.3%	- 501-750 "
6,923 "	- 4.0%	- 51-75 "	2,014 "	- 1.2%	- 751-1000 "
6,747 "	- 3.9%	- 75-100 "	2,634 "	- 1.5%	- 1001-2000 "

2,186 Wells - 1.3% - Over 2000 Bbls.

MID-CONTINENT OIL & GAS ASS'N.

CLASSIFICATION OF WELL COMPLETIONS

BY STATES AND YEARS, 1920 TO 1926, INCLUSIVE (East of California)

(Initial Production per Well in Barrels of 42 Gallons as Reported to The Oil and Gas Journal)

	Dry	Gas	25 bbls. or Less	26 to 50 bbls.	51 to 75 bbls.	76 to 100 bbls.	101 to 200 bbls.	201 to 300 bbls.	301 to 500 bbls.	501 to 750 bbls.	751 to 1,000 bbls.	1,001 to 2,000 bbls.	Over 2,000 bbls.	Total Wells
Total, 1920	7,972	2,249	12,480	2,997	1,274	1,348	1,918	1,048	798	368	284	252	172	33,160
Per Cent	24.0	6.8	37.6	9.0	3.8	4.1	5.8	3.2	2.4	1.1	0.9	0.8	0.5	100
Total, 1921	5,929	2,087	6,955	1,590	715	769	1,092	583	628	274	260	314	196	21,392
Per Cent	27.7	9.8	32.5	7.4	3.3	3.6	5.1	2.7	3.0	1.3	1.2	1.5	0.9	100
Total, 1922	5,883	2,021	8,135	1,699	816	851	1,550	683	705	360	374	495	378	23,950
Per Cent	24.6	8.4	34.0	7.1	3.4	3.6	6.5	2.8	2.9	1.5	1.5	2.1	1.6	100
Total, 1923	5,974	2,393	7,104	1,766	945	881	1,464	710	624	307	309	503	520	23,500
Per Cent	25.5	10.2	30.2	7.5	4.0	3.8	6.2	3.0	2.7	1.3	1.3	2.1	2.2	100
Total, 1924	5,138	2,303	5,850	1,697	857	879	1,461	663	671	261	251	338	230	20,599
Per Cent	24.9	11.2	28.4	8.2	4.2	4.3	7.1	3.2	3.3	1.3	1.2	1.6	1.1	100
Total, 1925	6,490	2,359	6,678	2,141	985	866	1,569	727	687	333	295	409	385	23,924
Per Cent	27.1	9.9	27.9	9.0	4.1	3.6	6.6	3.0	2.9	1.4	1.2	1.7	1.6	100
Total, 1926	7,778	2,344	8,131	2,571	1,331	1,153	1,907	745	663	299	241	323	305	27,791
Per Cent	28.0	8.4	29.3	9.3	4.8	4.1	6.9	2.7	2.4	1.0	0.9	1.1	1.1	100
GRAND TOTAL, 7 years, 1920 to 1926, inclusive	45,164	15,756	55,333	14,461	6,923	6,747	10,961	5,159	4,776	2,202	2,014	2,634	2,186	174,316
Per Cent	25.9	9.0	31.7	8.2	4.0	3.9	6.3	3.0	2.7	1.3	1.2	1.5	1.3	100

BAROID

makes well-drilling safer

This remarkable material seals off gases—gives wells and human lives a protection you never thought posssible! . . . . . .

BAROID, properly used, eliminates the danger of blow-offs, makes wells safe, protects the lives of drillers.

Poured down the well, Baroid builds a firm, erosion-resisting arch that effectively seals off the dangerous strata—those that bear trouble-making gases. Thus it prevents the eruptions that lead to disaster.

Baroid is a specially processed form of barytes—a fine white powder that will stay in suspension almost indefinitely. It is so fine that it will penetrate under pressure almost any formation encountered in drilling operations.

Furthermore, Baroid has remarkable lubricating qualities, assisting the drill bit in cutting through the hardest formations. And its sliming qualities protect the drill stem and both the inside and outside of the casing, thus preventing friction from the cuttings which emerge from the wall of the hole. Its action also prevents loss of circulation, fissures and caving.

Even on Cable Jobs!

Usually "mud-fluid" is associated only with rotary drilling operations. Yet a "Baroid-fluid" was used with entire success on a *cable tool job* at Winfield, Kansas. It was found that the fluid was heavy enough to seal off the gases, yet not heavy enough to interfere with the dropping action of the tools.

Truly, this new material offers the most thoroughgoing protection. It has been used by a large number of drilling companies throughout the Mid-Continent, Colorado and Wyoming fields—and *we have yet to hear of a single complaint or disappointment!*

Baroid is absolutely inert, non-electrolytic, non-electrostatic and non-poisonous. Its specific gravity is high—4.28.

Any of the companies listed below will be glad to send you prices and further information about Baroid.

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PICKERING LUMBER CO.
Pyote, Texas

ARKMO LUMBER CO.
El Dorado, Ark.

MIDLAND IRON WORKS
Billings, Mont.

FOXWORTH-GALBRAITH LBR. CO.
Pampa, Texas

PEDEN IRON AND STEEL CO.
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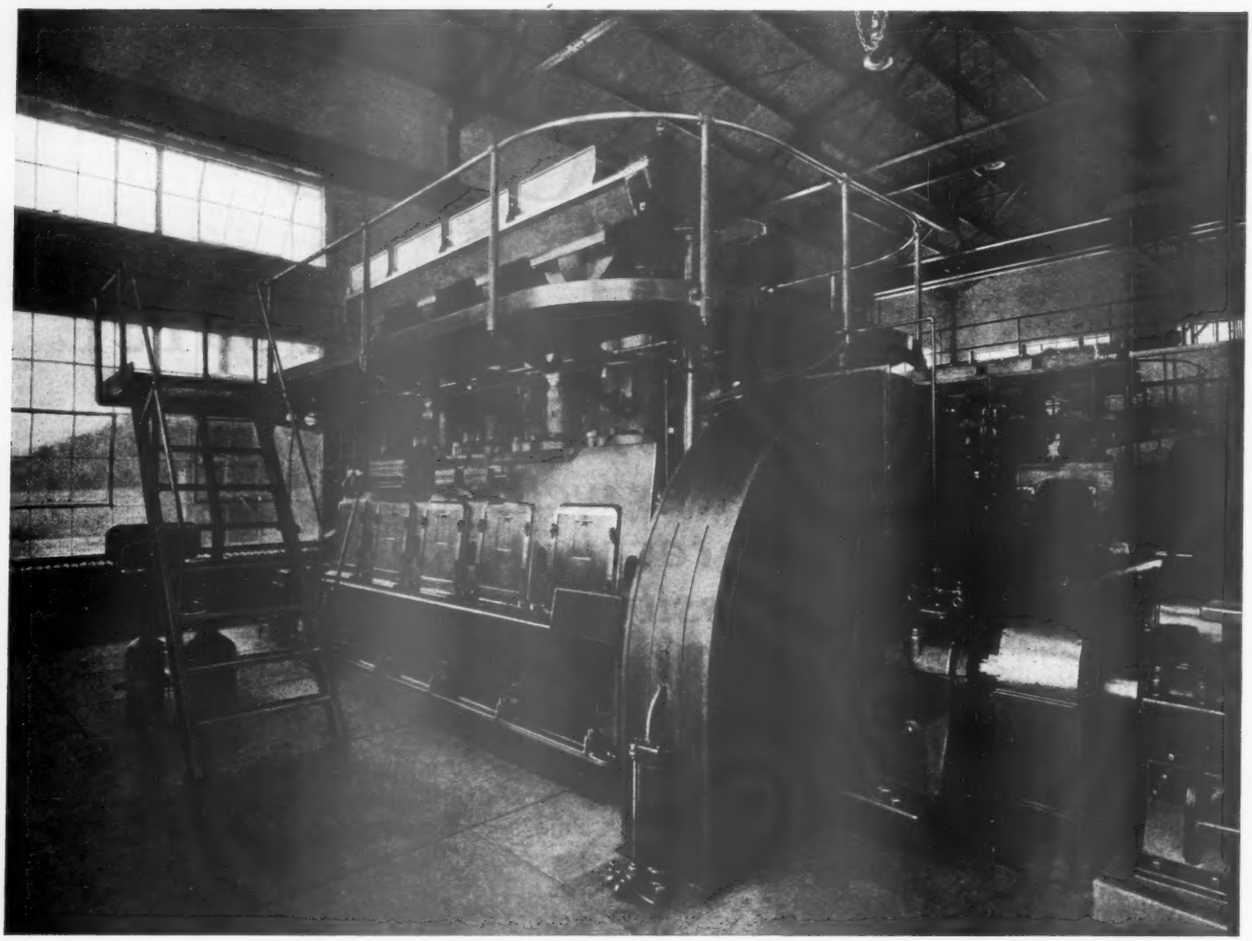
ST. LOUIS, MISSOURI



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Thorough dependability, low fuel rate and minimized maintenance expense make McIntosh & Seymour Diesel Engines easily the most desirable power units for pumping station service.

Their massive parts with liberally proportioned and well protected wearing surfaces make these engines safe for long runs at 100 per cent load factor, and the operating economy stays right at the top notch year after year.

The fuel rate is fixed in the design and is practically constant at given load as long as the engine stays in service. A unit of even moderate capacity produces 1 hp.-hr. from less than ½ lb. of oil. In contrast, a steam plant of corresponding size requires 2 to 7½ lbs. of coal per hp.-hr. *when in prime condition.* How nearly these figures are approached in the steam plant is determined by the condition of the plant and the skill of the operators, particularly the firemen, who in general are not and cannot be trained to produce good economies.

The sustained high thermal and mechanical efficiencies of the Diesel engine further make its purchaser reasonably safe against further improvement that would depreciate his investment, whereas even the most refined steam units have often been scrapped within a few years because they could no longer compete with later steam types.

What McIntosh & Seymour Diesel Engines would do in your own service is easily figured from proven performance. Our Engineers will gladly submit convincing data and assist in selection of the most suitable units.

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McINTOSH & SEYMOUR DIESEL ENGINES

All That Flows Not Gold at Seminole

Oil Produced Offset by Extraordinary Expense of Operating Showing Deficit of $25,000,000 for Field

By J. L. Dwyer

Although 15 months of disillusioning experiences have taught the operating companies in Seminole Field that with a few notable exceptions, no profit has been made upon the vast amount of oil taken out of the ground, the word Seminole is synonymous in the minds of the average reader with such words as wealth, millionaire, and dividends.

Considering only the glaring headlines which have met the eye, headlines which tell of enormous gushers, the average reader has some reason for being in this state of mind, for the darker side of the Seminole picture has not been revealed to his gaze.

If he will approach the problem with the indispensable quality of open-mindedness, and consider that although 122,473,089 bbls. of crude oil have been taken out of the ground, the producers' net share of this oil has resulted in an income of $125,870,672.46; while the total expense directly caused by this field is now $149,185,663.01, a deficit of nearly $25,000,000 between the two sums will be observed, he may well reflect that all which flows is not gold.

Since July 16, 1926, the date upon which the Independent Oil & Gas Co. and R. F. Garland discovered the prolific Wilcox sand in the Seminole Field, the reading public has had daily reports about the numbers of gushers in this great field.

Expense of Producing

Headlines have blared about the marvelous output of the wells in Seminole, and the natural assumption has followed that everyone connected with this development has become rich overnight. During all this excitement, very little has been mentioned about the expense of producing the Seminole oil, and scant attention has been bestowed upon the comparative figures of investment and income, except by auditors and executives of companies operating in the field.

The Greater Seminole Field has produced 122,473,089 bbls. from all sands since discovery to November 1, 1927, and this stupefying figure naturally is associated in the minds of the unacquainted with profits running into the tens of millions of dollars.

One fact which helped the companies in the field, and which will have a very important bearing upon the final determination of profit in the territory, is that the majority of leases covering this part of the country were taken at a reasonable cost. There are notable exceptions to this statement, and in some cases high bonus prices have been paid, but the average least cost in the area is limited.

The general manager of a company which has operated in every pool of the field remarked to the writer when discussing Seminole, "There are three factors at Seminole which are responsible for the profit we hope to ultimately obtain, first, luck; second we paid no large bonus price for leases; third, we stored a very large portion of our production."

Considering the general condition of costs and recovery to date, it might be mentioned that had the Seminole Field been located in the Osage Nation of Oklahoma, and the competitive system of bidding for leases used to dispose of the tracts, every company in the area would have been bankrupt, for with Burbank bonuses of $1,990,000 per 160 acres which is the record paid for Burbank tracts, the lease investment at Seminole would have crushed many of the companies.

Exceptional Costs

There never was a field like Seminole.

From the time when the material and equipment is removed from the flat car for transportation to the field, until the well is producing oil, the huge cost of every step connected with the drilling and producing work, is so far above the cost of other fields discovered to date that it is in a class apart from all other producing localities.

The heavy drilling activity was started during the fall rains of 1926, and the Seminole roads, none too good at best, were overnight transformed into morasses and swamps. Trucks found them impassable, and in some cases mud scows were hastily constructed to negotiate the trip to the well location. The road and weather conditions taught the Seminole operators the first lesson in excessive producing costs, for normal hauling and teaming figures were dwarfed in comparison.

Pipe line construction, rushing to meet the needs of the new field was pursued at a cost never before experienced in oildom, and the necessary construction time was almost doubled.

During November, 1926, a drilling contractor in the Seminole Field found it necessary to move a boiler from one location to another to replace a boiler which was defective. The move was about 1,300 feet in a straight line, and the total cost of transporting the boiler that distance, was $1,000. The ordinary cost of moving this boiler would not exceed $50, but Seminole established new costs before the field was producing 50,000 bbls. daily.

Unfavorable Drilling Conditions

When the first batch of drilling wells were started, the contract price for drilling was $6.50 per foot for rotary drilling and $5.50 per foot for cable tools. Unfavorable drilling conditions and the dozen of serious fishing jobs which were encountered, made the risk too great at this price, and, with many drilling contractors facing bankruptcy, the price for drilling in the field was advanced to $8 per foot. Even at this last figure, it is likely that a summary of the books of all drilling contractors in the field would show a staggering loss, for the supply companies have been obliged to take over the tools of many contracting firms. Within the past 30 days, a member of a drilling firm entered the office of the general manager of a company prominent in the field and when asked about his ventures wistfully remarked, "Successful, well hardly that, when we came to Seminole fom Texas we had $240,000 cash and five good strings of tools. Today we are flat broke, and have just two good strings."

Since the fishing jobs are ultimately items of cost to the producing companies, the dozens of plugged holes caused by pipe jobs and other fishing worries formed the second lesson of expense at Seminole.

The transportation and fishing were the items of unusual expense which constituted a chapter in the drilling contractors' activities at Seminole City, and when the field spread to Bowlegs and later to Little River, the road conditions became much worse. In the Bowlegs Field, a drilling contractor engaged a teaming contractor to move a string of tools about half a mile. The teaming contractor agreed to take the job for $1,200. It was a stiff price, but teams were none too plentiful. After six days of soul-trying efforts, the teaming contractor went to the drilling contractor and said that he was about to go broke, and that portion of the tools which were already moved could be considered gratis; he found it impossible to complete his contract. The drilling contractor realizing his plight, instructed him to proceed with the moving of the tools and agreed to pay all bills. Moving this one string of tools cost $2,400.

Roads Cost Heavily

It is estimated that $75,000 was spent in improving the roads in the Little River Field alone before any heavy hauling could be pursued.

To place one cubic yard of sand on the drilling location in the Greater Seminole Field, represented a cost greater than that of placing half a carload of the same material on a location in the average field.

One company in this field found it necessary to transport a 50 kw. generator a distance of 4 miles, a seemingly simple task. To accomplish it required 14 teams, and occupied 18 hours working time. There were places in the road which resembled shell holes, and when these were reached, it was necessary to hitch six teams behind to prevent the generator tipping completely over.

Seminole County received its proportionate share of the money collected by the Oklahoma gross production tax (3 per cent of all oil produced) but there was little work done by the county to improve the road conditions in order that the oil companies, which were directly responsible for the payment of this tax, could operate more efficiently. There was scant help from the county and state in improving the Seminole roads.

Inadequate police protection formed the next item of extraordinary expense at Seminole, and while apportioned over the oil produced it would not create a very imposing figure, a considerable sum was expended by the oil companies for this purpose. The were obliged to furnish their own private policemen for protection of property and life in the field.

Thorny Path of Progress

At every step of the thorny path of progress, the Seminole operators were held up. Tank farm sites, pipe line stations and all other land purchases and litigation, damage suits and "wash" lawsuits clouding title to leases which had been free from annoyance prior to the discovery of oil, all these added to the steadily mounting cost of bringing the Seminole oil to the top of the ground and storing it there.

After the oil was produced, and the tank farm built to store it, private pipe line systems were necessary to carry the oil to the tank farm from the well. This necessitated an expenditure of $525,000.

Since the rotary system of drilling was used in the field, a generous amount of water was required for each drilling well. The water problem was solved at first by drilling water wells to a depth of 50 feet, drilling three water

(Continued on Page 196)

EXPENDITURES DIRECTLY CAUSED BY THE SEMINOLE FIELD

Development cost—9,500 acres of producing land at $9,000 per acre	$85,500,000.00
This cost includes rigs, casing, drilling, separators, small tankage, air lift equipment, road construction, telegraph and telephone systems, water and gas distributing systems, teaming, freight and hauling, shooting, pipe fittings and wells, lease houses, plants structures and warehouses and all miscellaneous construction and labor.	
Cost of dry and abandoned wells	8,203,000.00
Pipe line construction—This includes cost of pipe line, freight, hauling and stringing, ditching, laying, painting, backfilling, right or way, telegraph and telephone, and all station equipment and material	7,037,702.00
Large storage tanks at Seminole—This represents cost of transporting and construction large tanks and tank cars	9,665,000.00
Large storage tanks in other locations used for Seminole crude by producers	1,650,000.00
Privately owned pipe line systems for moving crude from producing leases to tank farms	525,000.00
Loading racks and railroad sidings	60,000.00
Drilling contractors haulage costs—(Moving tools from one location to another in the field)	240,000.00
Lifting cost of Seminole oil—122,473,089 bbls. at 8.5 cents per barrel	10,410,212.56
Cost of leases in the four townships covered by the field (including litigation costs to protect titles)	12,393,000.00
Total	$135,602,914.56
Ten per cent overhead, superintendence, insurance and miscellaneous litigation, damage suits and legal expense	13,560,291.45
Umpire's salary and cost of office	22,457.00
Grand total	$149,185,663.01

REVENUE TO THE OIL PRODUCERS FROM THE GREATER SEMINOLE FIELD

	Barrels
Total oil produced	122,473,089
Total oil in storage	16,400,000
Amount of Seminole oil sold by producers	106,073,089
Total royalty oil (12½ per cent of production)	13,259,136
Oklahoma gross production tax (3 per cent)	3,182,192
Pipe line charges for b.s. (3 per cent)	3,182,192
Total deductions from producers crude	19,623,520
Amount of oil sold	106,073,089
Deductions for tax, etc.	19,623,520
Producers net oil from Seminole	86,449,569
The average price paid by purchasers to producers for Seminole crude from discovery to November 1, 1927, per barrel	$1.456
Producers income from Seminole production, 86,449,569 bbls. @ $1.456 per barrel	$125,870,672.46

Extent of Oil Reserves Misunderstood

Oft Repeated Statement That Our Petroleum Resources Will Be Exhausted in Six Years Refuted by Facts

By James McIntyre

A large section of the public has been led to believe that America's petroleum resources will be exhausted in six years. Daily newspapers and some men in public life have made this declaration unreservedly, and that part of the public unfamiliar with the oil business, has swallowed it whole.

The error came perhaps from misunderstanding a statement made in the preliminary report of the Federal Oil Conservation Board to President Coolidge wherein it was said: "The total present reserves in pumping and flowing wells in the proven sands has been estimated at about 4,500,000,000 bbls., which is theoretically but six years' supply, though of course it cannot be extracted so quickly." Why this should have been taken to mean that our petroleum reserves would be exhausted in six years is difficult to understand, but it was thus construed, and the statement has repeatedly been made and more badly garbled until a portion of the reading public has been led to believe that the oil business is on its last legs.

Even if no new wells were drilled for six years it would not mean the exhaustion of oil production in this country in that time, as there are many oil pools long ago completely drilled that have gone on producing and will continue to produce in paying quantity for many years to come.

The oil industry is too young for anyone to be able to say how long it should take to drill up an oil area. After 68 years of development work oil is still being drilled for and found in the Venango-Clarion district in Pennsylvania, the very cradle of the oil business, and every month sees the completion of oil wells in all the old oil-producing areas in the country.

How It Works Out

When oil is discovered in a county remote from an "oil region" the discovery is followed by a leasing campaign that covers the whole county and reaches over into adjacent counties. Each lease calls for the drilling of at least one well within a specified time to a sufficient depth to test out the petroleum possibilities of the property. Failure to drill the test or tests renders the lease void at the end of the period, usually five or ten years, but sometimes one year. The leasing campaign is followed by a campaign of drilling scattered over the territory. The original pool is followed perhaps by the discovery of one or maybe a dozen pools in the county. In some areas a field of vast acreage is developed; in other areas many scattered pools of small area result. In the boom period hundreds of wells are drilled at once. Later the drilling is on a more moderate basis.

The Case of Osage

It takes many years to exhaust the possibilities of new production. For example, take the Osage Indian reservation which occupies all of Osage County, Oklahoma.

That territory has always been operated under United States government supervision. The first well was drilled in 1896 and the county has produced 353,000,000 bbls. of crude oil since that time, yet only 15,875 wells have been completed in the county, or one well to each 95 acres. As the average Osage well drains about 6.4 acres it may be seen that only one-fifteenth of the land in Osage County has ever been tested by a drilling well, after 31 years of exploration and development work, or in other words there is undrilled room for 234,218 wells—more wells than can be found in New York, Pennsylvania, West Virginia, Ohio, Indiana, Kentucky, Illinois, Tennessee, Michigan, Kansas and North Central Texas, all rolled together. To be sure, much of the remaining Osage County acreage is regarded as unfavorable for oil, but no living man can say how much or how little new production will be taken out of that county in the years to come, or whether or not there is another field as productive as the Burbank pool, and the possibilities for deeper-sand production in the already-known areas are far from exhausted. In fact, it has been only 11 years since it was known that there was oil in large quantity to be found beneath the surface of the Mississippi limestone in Osage County, and this horizon has only in part been developed.

The law requires that 100,000 acres a year of Osage oil leases be offered for sale at auction and every sale is well attended and the purchase of leases is brisk. Osage County is producing around 60,000 bbls. a day at this writing which is only a little less than it produced six years ago. No sign of exhaustion there!

Production Then and Now

Returning to the matter of exhaustion of oil fields in six years the writer has gone over the records of production six years ago in all fields and the record of production of the same fields at present. On November 1, 1921, the production of all the fields in the United States was 1,307,202 bbls. On November 1, 1927, the production of those same fields was 1,193,014 bbls., a decline of only 8 per cent, made possible by continued drilling which resulted in new pools, extensions of pools, or the discovery of deeper producing sands in partly developed pools. Entirely new producing areas discovered between 1921 and the present, on November 1, were producing 1,276,636 bbls., or only 2.4 per cent less than the production of the entire country six years ago. Taken altogether the production on November 1, 1927, is over 87 per cent more than it was on the same date six years ago.

Six years ago it might have been said that the famous Spindletop, Texas, Field, which was opened in 1901, but which in the fall of 1921 had fallen to 860 bbls. a day in production, would be out of business in 1927, but as a matter of fact it is producing 50,000 bbls. per day because oil men, not satisfied that Spindletop had yielded all its oil, drilled deeper and found several other horizons which proved a bonanza of petroleum. Six years ago the Salt Creek Field in Wyoming was producing 35,000 bbls. a day. Now it is producing 32,375 bbls. and has 100,000 bbls. a day shut in in deeper sands discovered since, giving it a potential production of 132,375 bbls. a day at this time. The Ventura-Newhall Field in California six years ago was producing 6,766 bbls. a day and the same territory now is producing 6,060 bbls. while the newer Ventura Avenue Field in the same area is producing 56,000 bbls. a day. The Midway-Sunset-Elk Hills area in California six years ago was producing 127,579 bbls. Now it is making 110,000 bbls. a day. Fullerton, Calif., which was credited with 16,400 bbls. a day on November 1, 1921, produced 17,000 bbls. on the same date this year. Huntington Beach had a mark of 14,938 bbls. a day six years ago and 61,000 bbls. a day at present, while Long Beach with 405 bbls. then, is producing 93,500 bbls. now. Six years ago all the oil production in Arkansas came from the El Dorado Field which produced 44,425 bbls. on November 1, 1921, and while the same pool has fallen to 6,130 bbls., the nearby territory which was developed as a result of the discovery of El Dorado is producing around 100,000 bbls. a day. Brown County, in North Central Texas was good for only 400 bbls. six years ago, but instead of playing out entirely in the six years, is now producing 20,000 bbls. a day. Creek County, Oklahoma, the home of the celebrated Glenn Pool and Cushing and Bristow Pools has declined only from 57,592 bbls. six years ago to 55,700 bbls. at the present writing. Carter County, where the noted Healdton Field is located, has been dropped off only from 67,500 bbls. to 47,256 bbls. in six years. The high-grade oil district of Kay, Garfield, and Noble Counties in which the Tonkawa, Garber and other well-known pools are located produced 16,700 bbls. on November 1, 1921, and 48,500 bbls. on November 1, 1927. Even Pennsylvania and New York, the oldest of oil-producing territories instead of disappearing from the picture in six years are producing more oil this fall than in the autumn of 1921.

These examples could be repeated many times, but the changes in the past six years are shown in the accompanying tables. They tell a remarkable story of the longevity of oil fields and the results of deeper drilling and of persistent drilling in the neighborhood of pools already under the process of development. Hundreds of dry holes are drilled in counties where oil is discovered but the producing end of the industry never quits trying to find other pools until all possibilities are exhausted.

Future of Production

The present and future of the producing industry in this country lies mainly in the states west of the Mississippi River and these thus far have barely been scratched. Only a very small fraction of the possibly oil-bearing territory in the western half of the United States has been tested adequately. Five years ago it would have been very hard to interest the large majority of oil men in the possibilities of the area made up of Seminole and Hughes Counties in Oklahoma, which has since developed into the most sensational oil producing region in the world, and which in midyear produced a peak of about 560,000 bbls. a day from a dozen pools.

That territory had been tested out for years but no one had gone deep enough. When deep drilling opened the first pool the rest followed because they were there all the time and it required only money and courage to find them. Many tried and failed, a few tried and succeeded. That will be the history of the western fields of the future.

No longer is there any hesitancy over the cost of deep drilling. Drilling 6,000 feet deep is now common in California, and several wells are drilling in Oklahoma to find Wilcox sand at that depth because one company found it and has a paying producer at 5,990 feet. These wells will cost over $100,000 each where 15 years ago the average cost of drilling wells in Oklahoma was $3,169 per well.

PRODUCTION OF OLD AND NEW FIELDS

	Prod. of all fields Nov. 1, 1921	Prod. of same fields Nov. 1, 1927	Prod. of newer fields Nov. 1, 1927	Prod. of all fields Nov. 1, 1927
	Bbls.	Bbls.	Bbls.	Bbls.
New York	2,260	6,200	.....	6,200
Pennsylvania	19,800	26,000	.....	26,000
West Virginia	20,300	18,000	.....	18,000
Ohio	18,867	21,000	.....	21,000
Indiana	2,865	2,400	.....	2,400
Illinois	27,900	18,650	.....	18,650
Kentucky	23,925	19,400	.....	19,400
Tennessee	40	300	.....	300
Michigan	.....	.....	1,300	1,300
Kansas	89,105	85,766	19,034	104,800
Oklahoma	321,225	294,800	464,700	759,500
North Central Texas	147,876	84,618	58,382	143,000
West Texas	.....	.....	210,000	210,000
Texas Panhandle	.....	.....	87,500	87,500
East Central Texas	45,000	9,200	20,500	29,700
Gulf Coast	99,614	122,805	20,105	142,910
Southwest Texas	.....	.....	29,500	29,500
North Louisiana	60,890	34,185	17,565	51,750
Arkansas	44,431	6,130	94,470	100,600
Montana	4,766	2,000	11,700	13,700
Wyoming	50,481	47,860	3,290	51,150
Colorado	287	850	5,650	6,500
New Mexico	.....	.....	1,790	1,790
California	327,640	392,850	231,150	624,000
Totals	1,307,202	1,193,014	1,276,636	2,469,650
				Bbls.
Decline in production in six years of fields producing in 1921				114,188
Production of fields discovered since November 1, 1921				1,276,636
Net increase in production in six years				1,162,448

Note—New producing areas in the old producing states east of the Mississippi River in the six-year period were negligible and are not included.

California

	Prod. Nov. 1 1921	Prod. Nov. 1 1927
Kern River	19,200	17,500
McKittrick	5,900	4,900
Midway-Sunset-Elk Hills	127,500	110,000
Lost Hills-Belridge	9,999	4,000
Coalinga	34,000	19,300
Santa Maria	14,200	5,650
Ventura-Newhall	6,766	6,060
Los Angeles-Salt Lake	3,500	1,665
Whittier-Fullerton	18,698	18,735
Coyote	20,300	14,000
Montebello	24,500	14,400
Richfield	27,441	22,000
Huntington Beach	14,938	61,000
Long Beach	405	93,447
Watsonville	148	53
Summerland	145	140
Total	327,640	392,850

Oklahoma

	Prod. Nov. 1 1921	Prod. Nov. 1 1927
Washington County	7,375	5,940
Nowata-Rogers Counties	7,100	6,500
Osage County	65,800	60,000
Tulsa County	9,860	10,800
Okmulgee County	25,100	18,600
Okfuskee County	14,125	6,100
Muskogee - Wagoner Counties	3,950	1,000
Creek County	57,592	55,700
Pawnee County	10,400	10,611
Payne County	12,100	12,220

Two Tests for Pipe Line Coatings

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"LOOK back if you would see ahead" is a saying which applies most aptly to the choice of pipe line coatings. In studying the past performance of BITUMASTIC ENAMEL, for example, engineers have been able to look back for more than forty years. They have found a record of endurance unapproached by any other form of coating and BITUMASTIC has, consequently, been used for the protection of the world's largest water, oil and natural gas lines. You will be interested in the history of this most durable enamel and we will be glad to send you a copy of the book here illustrated. It is a history which will help you to apply "the test of time" when judging the protective qualities and durability of pipe line coatings.

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WHILE time affords the surest test it is not necessary to experiment for forty years or more in order to determine the superiority of BITUMASTIC ENAMEL. An *intensive* test—conducted under extreme conditions—will soon reveal a noticeable difference. Take two sections of steel pipe, for instance, and coat one of them with BITUMASTIC ENAMEL. Coat the second section with any other coating you may wish to compare. Immerse them both half way in a saturated salt solution or bury them completely in a cinder fill or other corrosive soil. Allow them to remain for several months and compare results.

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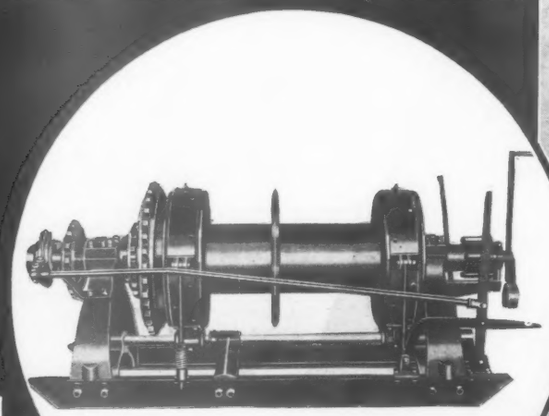
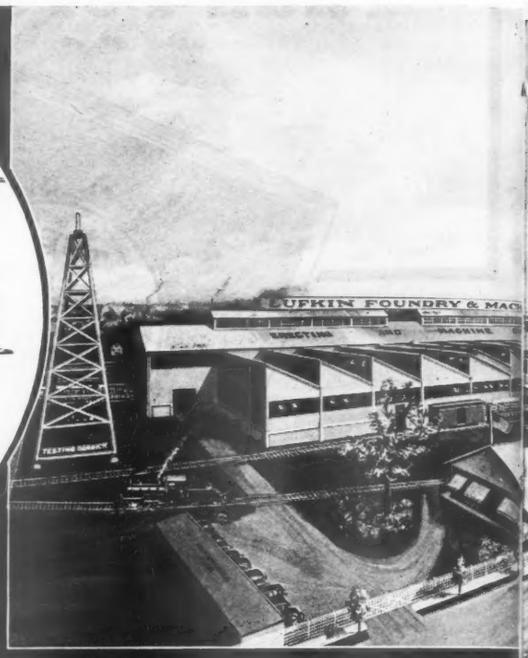
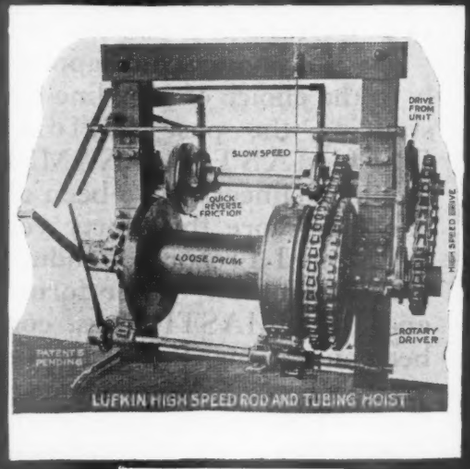


Lufkin double Brake Hoist.

Lufkin Baby Unit for pumping individual wells.



General view of Lufkin Foundry and Machi



Lufkin high speed rod and tubing Hoist.

Manufactured at Lufkin, Texas

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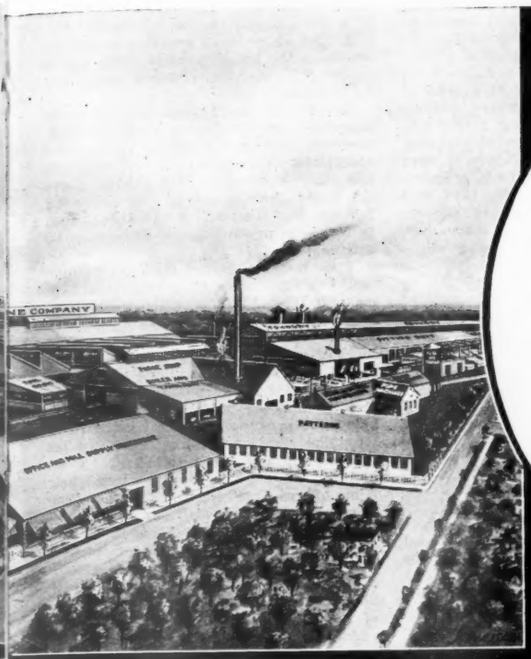
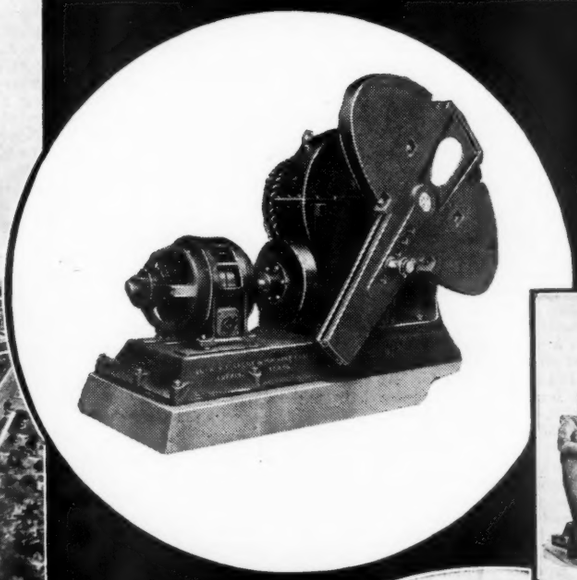
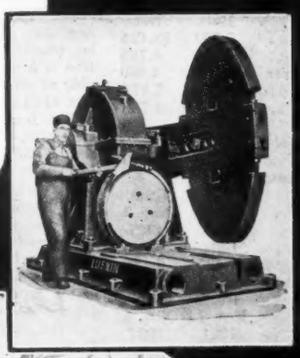
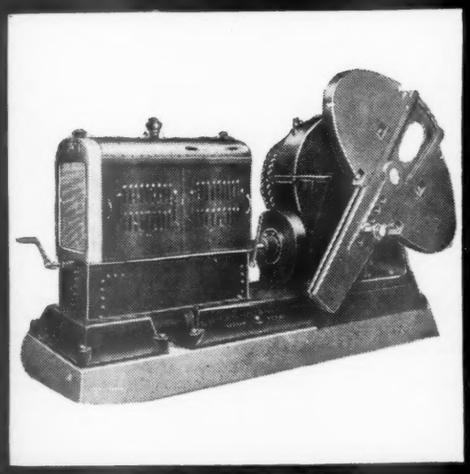


Machine Company, Lufkin, Texas.

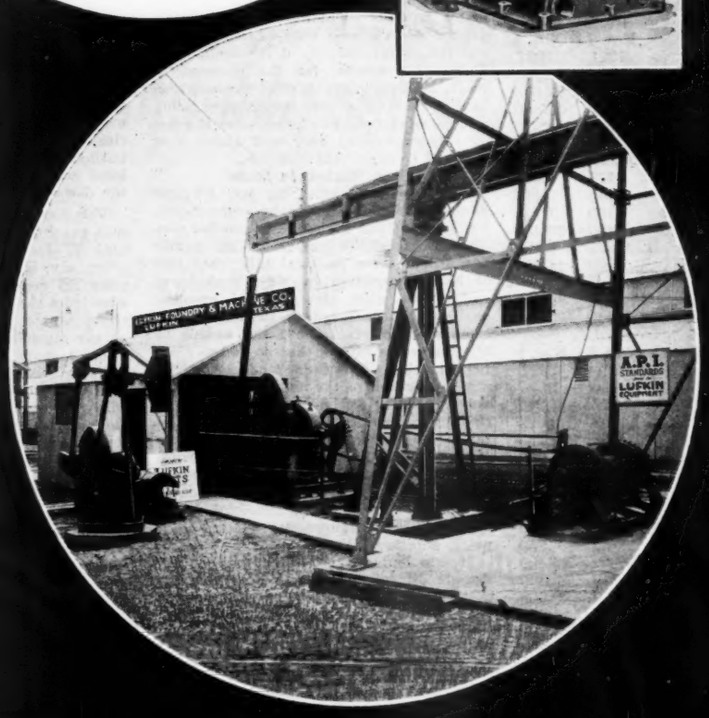


Lufkin Units are now equipped with a powerful brake. Every operator will appreciate this added convenience.





Lufkin Units may be used with electric motor or gas engine.



Manufactured at Lufkin, Texas

By

THE LUFKIN FOUNDRY AND MACHINE CO.

DISTRICT OFFICES:

LOS ANGELES TULSA NEW YORK HOUSTON

WAREHOUSES:

SEMINOLE, OKLAHOMA ODESSA, TEXAS EL DORADO, ARKANSAS

Kay - Garfield - Noble Counties	16,700	48,500
Carter County	67,500	47,256
Stephens-Cotton Counties	21,173	9,623
Miscellaneous	2,450	1,950
Total	321,225	294,800

Kansas

	Prod. Nov. 1 1921	Prod. Nov. 1 1927
Marion County	23,500	3,060
Butler County	46,500	28,375
Greenwood County	6,191	32,280
Allen County	1,670	660
Chautauqua	3,716	2,400
Elk County	626	2,150
Montgomery County	2,325	1,550
Wilson County	528	210
Neosho County	1,435	600
Miami County	814	2,650
Franklin County	782	490
Bourbon County	138	16
Linn County	528	235
Anderson County	20	1,965
Labette County	82	25
Cowley	250	9,100
Total	89,105	85,766

Louisiana

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
Caddo Light	7,750	13,425
Caddo Heavy	4,990	4,785
DeSoto and Red River	8,550	4,050
Haynesville	13,725	7,175
Homer	25,875	4,750
Total North Louisiana	60,890	34,185

Arkansas

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
El Dorado	44,425	6,130

North and Central Texas

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
Burkburnett	44,431	12,003
Electra	11,150	12,089
Iowa Park, etc.	5,340	2,993
Eastland County	14,470	8,425
Stephens County	57,335	8,900
Shackelford County	725	5,043
Palo Pinto County	150	449
Coleman County	150	1,140
Brown County	400	20,450
Comanche County	6,025	1,450
Young County	7,700	11,676
Total	147,876	84,618

Gulf Coast Fields

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
Batson	1,275	1,240
Blue Ridge	699	2,525
Dayton	38	225
Damon Mound	2,715	820
Edgerly, La.	560	2,275
Goose Creek	12,400	7,725
Humble	7,650	3,625
Hull	16,475	17,900
Markham	135	250
Orange	3,650	4,400
Pierce Junction	6,740	10,800
Spindletop	860	50,000
Saratoga	2,200	1,055
Sour Lake	4,600	4,060
Somerset and Piedras Pintas	1,010	2,380
Vinton	3,475	5,000
West Columbia	34,150	8,100
Welsh-Anse LaBute	82	25
Miscellaneous	900	400
Total	99,614	122,805

Wyoming

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
Salt Creek	35,000	32,375
Big Muddy	4,400	2,950
Grass Creek	3,125	2,750
Elk Basin	1,200	1,260
Hamilton Dome	90	610
Pilot Butte	125	275
Lance Creek	938	1,325
Mule Creek	197	675
Osage	458	315
Lost Soldier	1,205	2,325
Ferris	246	50
Rock River	2,970	2,600
Dallas	383	....
Miscellaneous	144	350
Total	50,481	47,860

Montana

	Prod. Nov. 1 1921	Prod. Nov. 1 1927
Cat Creek and scattering	4,766	2,000

Colorado

	Prod. Nov. 1 1921 Bbls.	Prod. Nov. 1 1927 Bbls.
Florence-Boulder	287	850

How Competition Dictates Prices

Situation in New York Shows How Marketing Conditions Regulate Situation

By N. O. Fanning

New York Bureau, The Oil and Gas Journal, Room 629, No. 101 Park Avenue, New York, N. Y.

In these days of talk on oil regulation it is particularly timely to inquire into competitive conditions and the general marketing situation as related to gasoline, the most important product of crude oil from the viewpoint both of consumer and producer. There is no place more fitting for a study of conditions than the Atlantic seaboard, where at least 25 per cent of the gasoline consumed in the United States is used.

Gasoline, as the oil industry knows, is a fraction of crude oil once thrown out as waste, then later used in a pleasure sense for motoring and now entering strongly into the social and industrial life of the nation wherever transportation is required. Gasoline has achieved a position as one of the few major requisites of civilization. The failure of the supply for even a few weeks would seriously interfere with the ordinary tenure of daily life. Without the motor vehicle the transportation facilities of the country would be wholly inadequate. Therefore, gasoline is a commodity which must be available at all times, with a substantial quantity always in reserve for any emergency.

The leading oil companies have realized this situation and appreciate the responsibility which rests with them in having to supply a possible emergency demand, while at the same time operating on a sound business basis. In order to meet the present situation, in which gasoline stands as more important in the life of the nation than ever before, the leading oil companies have been spending many millions of dollars in developing future reserves at a time when there is a current overproduction of the commodity. Doing this means, for the moment at least, making heavy capital expenditures in the face of a low return per gallon and in most instances it requires the use of surplus capital over and above that received from current business.

How Market Is Made

The gasoline market on the Atlantic Seaboard is fixed solely by competition. Prices are fixed by local competitive conditions. A feeling has grown up, partly because of loose political talk, that two of three executives in New York meet and decide what the price of gasoline shall be in the territory in which their company markets, then issue orders to all their sales offices that so-and-so shall be the price. This fallacy has grown up also as a result of the publication of tank wagon prices by the head offices of the leading companies. Where a company publishes a tank wagon price for such a large territory as New Jersey, New York, or New England, the impression is gained that an arbitrary price has been laid down at headquarters, and the suspicion is enhanced through ignorance that the said price, whatever it may be, is exorbitant.

If one had access to the files of the leading oil companies and were familiar with their methods, one would have a vastly different conception of the situation.

The publication of the tank wagon price is a holdover from the days when gasoline was of much less importance in the scale of things than it is now. Formerly, practically all sales of gasoline by refiners were made by tank wagon deliveries from refineries or near-by railroad bulk stations to service stations at a fixed tank wagon price. The percentage of total sales represented by this type of business is growing smaller and smaller. Now gasoline is bought from refiners by big garages, chains of service stations, bus and motor truck companies in very large quantities at prices f.o.b. refinery, plus freight, and is moved in tank cars to bulk stations maintained by the refiners or by the purchasing companies, which in turn either use the gasoline direct or sell it.

This type of business has grown to such large proportions that the refinery price, so-called, has become more important than the tank wagon price as a gauge of market conditions. But of course the average consumer—the user of a family car—still deals only with the garage or service station, and does not come into direct contact with the bulk sales situation.

Dictated by Competition

The prices fixed in these f.o.b. refinery sales is dictated wholly and solely by competitive conditions. Users of large quantities of gasoline buy their material where they can get it most cheaply for the quality of material they desire. While much business is arranged on contract, prices are on a sliding scale, and therefore are influenced by day-to-day competitive conditions.

Refiners, however, still sell considerable gasoline to service stations either owned by them or buying from them exclusively. Prices at which this type of business is transacted are also fixed by local competitive conditions and not by the dictum of headquarters.

For instance, a refiner near New York sells gasoline to a service station at Trenton, N. J. The prevailing tank wagon price, say, is 16 cents a gallon and retail price 18 cents. The refiner receives a wire from the salesman at Trenton to the effect that a competitive service station on the opposite corner has cut the retail price 2 cents to 16. The salesman invariably receives orders to meet the competition. At Camden, N. J., not many miles distant, a service station buying from the same refiner is selling gasoline for 18 cents, and as all competitors are selling on the same basis, there is no need for cutting the price. Therefore, the same gasoline may be sold at the single Trenton station for 16 cents and at the Camden station for 18 cents at the same time.

A check-up on the situation can be made by any motorist with the purpose of proving the potency of local competition as opposed to arbitrary price fixing. If oil company executives ignored local conditions they would soon go out of business.

Determination of Price

Granted that prices are fixed by local competition, the next question has to deal with how whatever prices are in existence are determined. There must be some basis for a price of 10, 15, or 20 cents a gallon at which gasoline may sell at one time or another.

The minimum price of gasoline of a recognized quality—say United States Navy specification gasoline—is the lowest price at which the product can be sold at a given place and at a given time and afford a reasonable profit to those concerned with handling it.

In the Atlantic seaboard probably the basic price of such gasoline is dependent on the following factors:

1. Cost of crude oil.
2. Cost of transportation of crude oil from field to refinery on Atlantic seaboard.
3. Cost of refining.
4. Cost of transportation of the finished product from refinery to spot where it is finally sold to the consumer.
5. All above items granting reasonable profit to the handlers after deduction of overhead, taxes, depreciation, and other fixed charges.

Gasoline is not always sold at prices depending on the above considerations, however, due to changing competitive conditions. There are times when prices fall slightly below or rise slightly above the basic price fixed by the foregoing factors. But competition will always tend to force the product up or down from an artificial level.

The manner in which competition works is illustrated by a recent development in the Atlantic seaboard market. Near Norfolk, Va., practically all gasoline service stations had maintained a certain level of prices. One day a cargo consisting of several million gallons of gasoline was unloaded at Norfolk and sold in the vicinity to a chain of stations at prices below the prevailing market in the vicinity. The stations handling this gasoline immediately cut the retail price. Competitors of these stations wired their home offices apprising them of the situation, and they forthwith cut their prices to meet the situation. As soon as this cheap gasoline had been sold prices were restored to the original levels, in as much as there apparently was no more available in cargo lots at prices equaling that of the shipment referred to.

Any circumstances enabling an oil company to deliver gasoline in large quantities at prices below the prevailing market are bound to force competition down to that company's level of prices. That is a rule as true of gasoline as of other leading commodities on which civilization depends.

Basis of Success

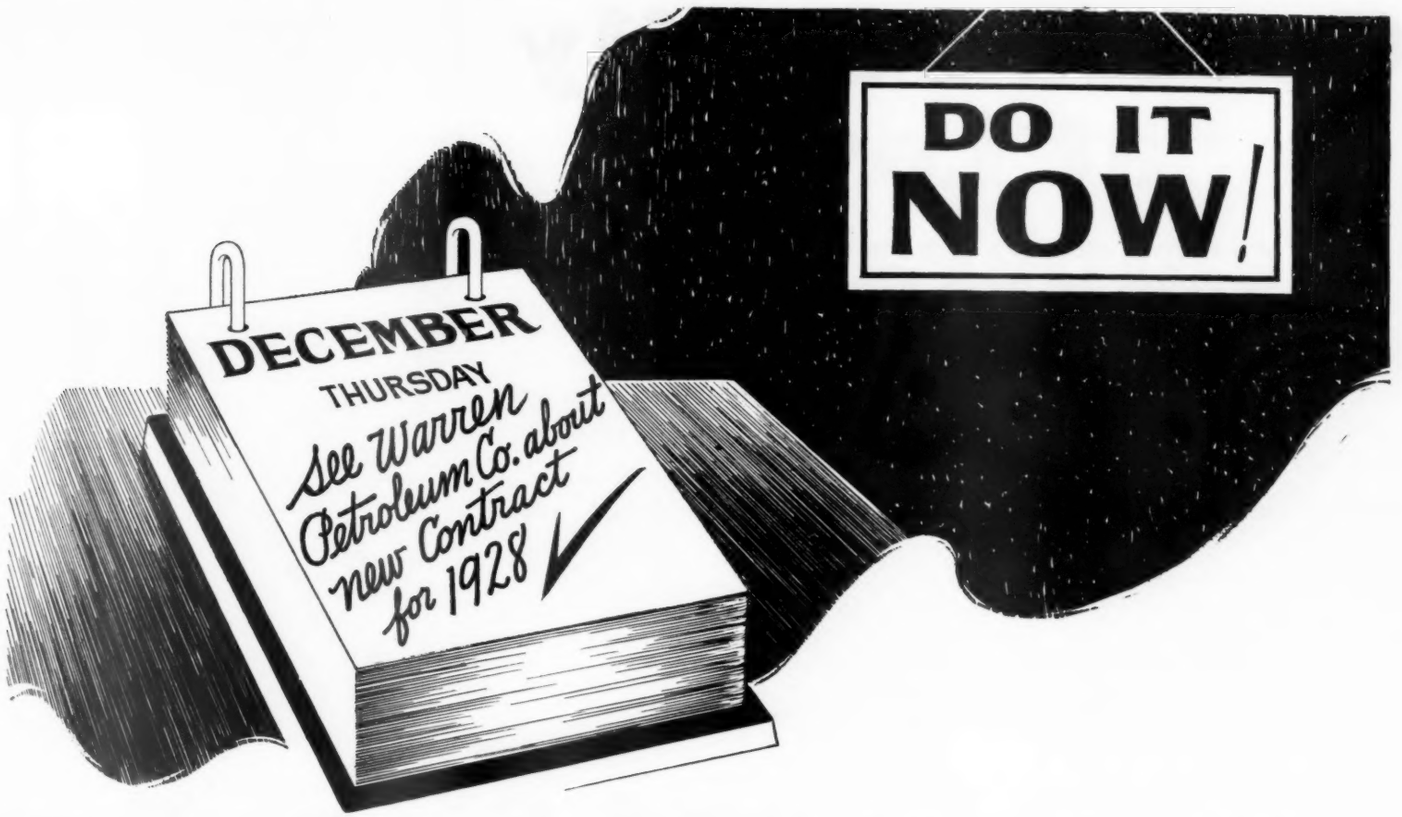
The successful oil company is not the one, as many people suppose, which can maintain an excessive price for its product. The determining factor in a company's success is the ability to maintain a reasonable average profit over a long period of time. The most successful oil companies today are those which have studied conditions so closely that they know how to meet every situation and can keep their expenses and costs in line with prices received for their products.

The gasoline market on the Atlantic seaboard gives an indication of how difficult it must be for oil companies to maintain an equitable balance under present market conditions. Gasoline is available on a retail basis at from 13 to 20 cents a gallon, prices in each locality fixed by competitive conditions which in most instances vary. Meeting a situation like this is vastly apart from the picture often painted of the oil companies sitting back and reaping in the profits without regard to purely business conditions.

MORE OIL BY DEEPER DRILLING

Wells producing oil from a depth of 3,000 feet were scarce as late as 20 years ago. Any depths materially greater than 3,000 feet were, at that time, not considered practical to drill, or to operate if such deeper oil did exist, which was then considered improbable.

We are now producing large quantities of crude oil at depths below 5,500 feet, and some oil from as deep as 7,200 feet. The experienced oil producers, backed by their geologists' opinions, believe that we may produce oil from as great a depth as 10,000 feet and from even greater depths. New and better equipment and methods of drilling and producing oil make such predictions seem possible.—J. Edgar Pew, vice president Sun Oil Co.



The World's Largest Natural Gasoline Sales Organization—can profitably serve you in 1928

The marketing services of a nationally known natural gasoline sales organization are at your disposal, without entailing one cent of additional overhead, for 1928.

The entire output from more than fifty natural gasoline plants, strategically located to give prompt, dependable delivery of all grades of natural gasoline, in Oklahoma, Louisiana, Arkansas, Kansas and Texas, was bought this year by refiners who found Warren service to be the ideal source of supply for their natural gasoline requirements.

The Warren Petroleum Company, whose growth and leadership are built on the confidence inspired by its sales and service to natural gasoline manufacturers and refiners, merits your consideration when you plan your program for the coming year. Our representative will gladly give you full details, without, of course, obligating you in any way.

WARREN
PETROLEUM COMPANY

FIRST NATIONAL BANK BLDG., TULSA, OKLAHOMA

Goes On Easily at Low Temperatures

NO-OX-ID is prepared for winter application so that it is worked just about as easily as in summer weather. This illustration shows removal of frozen earth and snow from line previous to applying NO-OX-ID.

Note temperature reference in report that accompanied this photo:

> "Yesterday - - - -, we coated some joints that were not covered with ice, which proves that NO-OX-ID can be applied regardless of how cold it may be. It was 29° below, so you can tell the world it can be done. The - - - - Co. people are all pleased with the ease with which NO-OX-ID goes on and also with the wrapper application."

—and Stays Put

This line remained on top of the ground over the winter due to the earth being frozen. After the usual thaws and freezes, spring inspection showed "the coating is effective and good adhesion has been obtained even though application was made under adverse conditions."

Winter conditions are extremely destructive to exposed pipe lines. Use NO-OX-ID to overcome this loss. Our products serviced by experienced men. Correspondence invited. We will gladly give you data on results, and recommend for your conditions.

Dearborn Chemical Company

"A House of Chemical Engineers" In Its Fortieth Year of Service to Industry

310 South Michigan Ave., Chicago **299 Broadway, New York**

Canadian Offices and Factory: 2454-2464 Dundas St., West, Toronto

DEARBORN CHEMICAL COMPANY
NO-OX-ID-IZED WRAPPER
REG. U.S. PAT. OFF.
NEW YORK CHICAGO

NO-OX-ID
IRON + OX = RUST
TRADE MARK
The Original Rust Preventive

Great Service Rendered During War

Pipe Line Companies, at Own Expense, Looped Their Lines to Provide Additional Capacity for War Needs

No adequate history has been written of the part oil transportation played in the World War. The mobilization of transportation media for war service, the concentration of available facilities on essential services and the intensive expansion of facilities, undertaken at great outlay of capital by American oil companies, constituted a valuable contribution to the winning of the war. Moreover, no story is more eloquent of the fundamental importance of transportation. The Oil and Gas Journal is able to give herewith many facts in connection with oil transportation and the World War never before published.

When the Advisory Committee on Pipelines for the Atlantic Division of the National Petroleum War Service Committee was formed early in 1918, there was a great lack of crude oil on the Atlantic Seaboard. This was largely due to the diversion of certain vessels from their normal trade to war work, which made it impossible to bring here the usual supply of crude oil from Mexico. The "pipeline" from Mexico is a floating one—i.e., by steamer. War industries, too, had sprung up all around with their demands for oil fuel, while the requirements of the Atlantic boats increased the consumption enormously.

Increasing Capacity

It was therefore necessary that the refineries on the Atlantic Seaboard be run at top capacity. To accomplish this the pipelines had to be pushed to their utmost limit. To avoid a constriction in pipeline transportation—which would amount to a "bottleneck"—it was decided to build loops on various lines and add to the pumping equipment. Four companies—the Prairie, Illinois, Indiana and Buckeye Pipe Line—agreed to undertake the construction required, at their own expense. This estimated cost was $2,500,000. It involved the laying of 208 miles of 8-inch pipe, as well as the installation of additional pumping machinery.

Other companies agreed to almost as ambitious suggestions for increasing their pipeline capacity.

In order to increase the capacity of its lines terminating at Whiting, Ind., the Sinclair-Cudahy Co. agreed to build a pipeline 230 miles long, with pumping facilities and steel storage, involved a total estimated expenditure of $3,000,000.

The Tide Water Pipe Co., Ltd., made, as its contribution, the completion of the looping of its line between Rixford, Pa., and Bayonne, N. J. This necessitated the laying of about 35 miles of pipe, the cost of which, with the required additional pumping machinery, amounted to more than $500,000.

Not all this work was completed at the time of the signing of the armistice. The normal shortage of labor everywhere had been greatly intensified by the influenza epidemic. Nevertheless, great progress was made despite the handicap. The oil division had made a point of hastening shipments of pipe and machinery.

In the meanwhile, through the adoption of intensive methods, a rate of delivery of oil was obtained far in excess of what would have been possible under normal conditions.

Improvements all around were booming along when the armistice was signed. The immediate necessity for this work disappeared over night.

Glasgow Pipeline

In Great Britain the most constructive bit of work, in a war way, was the building of the Glasgow pipeline. That, too, was finished just about the time the armistice was signed. This line extended from just outside of Glasgow right across Scotland and discharges on the East coast of the Firth of Forth, a distance of 37 miles. It consisted of a single 8-inch pipe with two intermediate pumping stations.

This line not only made for the flexibility of oil stocks, since you could pump from west to east or vice versa, but it saved a great amount of tonnage because, instead of making a long haul around Scotland to get to the naval base, the tankers could discharge on the west coast. Therefore, a smaller number of ships could move the same amount of oil. Thus there was not only a direct saving in tonnage, but an incidental decrease in war risks. This pipeline was built in an extraordinarily short time with American material and by American men, both men and material carried across the ocean for the purpose.

The French Government was talking of a pipeline from Havre to Rouen about the time the war closed. The French Government was willing to pay for it, but it desired the American Government to provide the material and lay the pipe. The distance from Havre to Rouen is 55 miles. The assertion was made that this pipe line would save five days by steamer from Havre to Rouen, and while the submarines were plying their calling, this meant much.

Tankcar Movement

No department of the oil industry was of more use to this country and the allies during the war or acquitted itself with more credit than that which had to do with the movements of tank cars.

The Advisory Committee on Tank Cars of the National Petroleum War Service Committee was made up almost entirely of men whose business careers had been devoted to the transportation of petroleum by rail. The immediate objective of this advisory committee was the prompt transportation of oil by rail not only to various ports for shipment overseas, but also to munition plant centers at home, and to other centers for industrial uses generally.

For several months in the early part of 1917 there had been a radical decrease in the railroad mileage made by tankcars. This had reached such a pass that in the first of the summer of 1917 the oil industry had notified the railroad management that unless every possible effort was made to expedite the movement of both loaded and empty tank cars a shortage in oil supplies for domestic trade would result—for which the railroads could consider themselves directly responsible.

At this time water transportation had been reduced nearly 50 per cent, thus bringing an added burden to the railroads. To offset this it was not only necessary that the movement of tankcars be greatly expedited but that the tankcars under construction be hurried to completion.

Notwithstanding this situation, not only were the cars under construction not delivered on schedule time but the movement of tankcars dropped from two and a half trips a month to less than one trip. Oil products were simply "not moving."

Traffic Congestion

The severe snow and cold of the winter of 1917-1918 with its frightful railroad congestion made matters worse. By the middle of 1918 and added demand, for aviation naphtha, was making itself felt. The shipment for November, 1918, of this product alone called for 58,000 tons.

As the amount of aviation naphtha contained in crude oil is limited, the seaboard refineries alone could not meet the demand. It became necessary to call upon many of the interior refineries to help out. This meant drawing supplies by tankcar not alone from the Mid-Continent and Pennsylvania oil regions but even from California.

Had the war continued the program as adopted would have required the delivery each month of 55,000 tons of aviation naphtha.

When the Advisory Committee on Tank Cars was formed in May, 1918, the opinion prevailed in Washington that there were not enough tankcars to meet the situation; that the Government might feel obliged to build from 10,000 to 20,000 of them just to move the oil in which the Government might be directly interested.

The National Petroleum War Service Committee and the oil director of the Fuel Administration were very much concerned over this, for if these cars were necessary their manufacture should begin at once. If, however, they were not necessary the steel which would otherwise go into them could be saved and used by the Government for some other important purpose.

The winter just passed with its traffic congestion and blockades had reduced the tankcar mileage in the East to as low a monthly average as 18 miles per car per day. In the West the service had been better but not good enough to meet the requirements.

Met Crisis Quickly

The advisory committee met the crisis quickly. After carefully considering all available statistics, the committee decided that if the railroads, east and west, could increase the average daily mileage of loaded and empty petroleum carrying tankcars to about 45 miles per day per car, the problem could be solved successfully with the tank cars known to be in service. These numbered 70,000.

There were, too, 15,000 cars under contract and in course of construction. With this possible total of 85,000 cars it was decided that it would not be necessary for the Government to build any tank cars on its own account.

The Advisory Committee on Tank Cars immediately perfected an organization, therefore, whose object was to bring about the prompt handling of petroleum, with the 70,000 tankcars then available. The Government was urged to build locomotives—not tank cars.

This organization with the approval of the National Petroleum War Service Committee, appointed supervisors, clerks and competent railroad car tracers. It leased offices. Its cost was estimated at about $75,000 a year. The chairman, vice chairman and secretary-treasurer received no compensation. The oil industry supervisors were paid competent salaries because, to properly perform their duties, they had to resign their former positions.

Two supervisors of rail transportation were appointed, one located in Kansas City, for the West, the other in New York City for the East.

Industry Responded Fully

In order to anticipate the tonnage direction and other details of movements of petroleum oil in tankcars, so that concentration points could be decided upon, and train load movements and other matters of the kind arranged for, all the refineries and oil shippers east of the Mississippi River were requested to send to the supervisors of rail transportation a statement of their entire oil shipments for the month of June, 1918. Not a member hesitated to give up the records of his private business. Full and complete statements covering the period asked for were turned over.

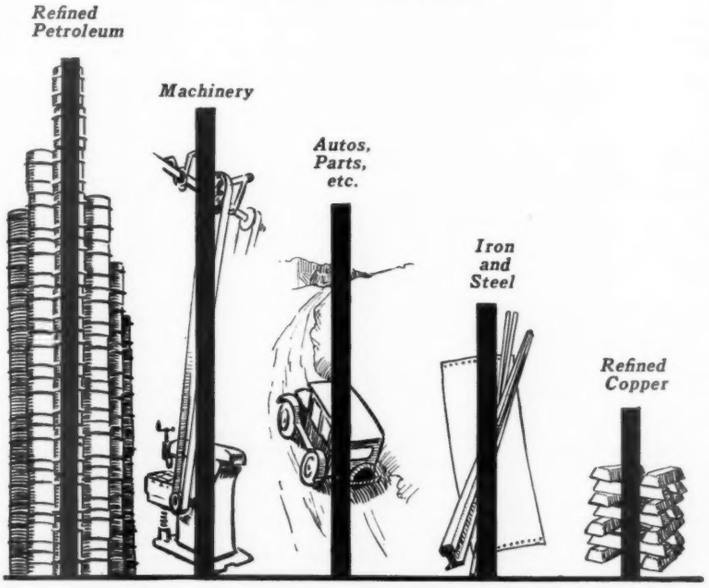
As a result concentration points for trainload movements were decided upon, through schedules arranged for a certain "oil route" selected.

In the East at this time the traffic on many roads was very heavy on account of the output of munitions and other war material plants. Petroleum oil traffic and particularly that going to the seaboard therefore was assigned to other roads and groups of roads to avoid the rails of such congested carriers. By grouping shipments into trainload lots the problem was solved to the best advantage.

Thereafter aviation naphtha, Navy gasoline, Navy lubricating oils and fuel oils were moved to tidewater by trainload and the empty cars returned in full train movements.

The requirements of the army for motor gasoline and for many other purposes were promptly met; munition and other

OIL INDUSTRY GREATEST EXPORT SHIPPER OF MANUFACTURED PRODUCTS



manufacturing plants were kept well supplied with oil, and the important needs of the agricultural districts for gasoline and other oils for tractors were taken care of. There were always tankcars in plenty where they were most needed.

The last reports of the oil supervisors show that as high an average as 46 miles per tankcar per day has been made in the East, and 58 miles per tankcar per day in the West.

No need developed for government-owned cars to handle petroleum oils. At the time the armistice was signed few tankcars were in service other than the original 70,000.

The services of the advisory oil supervisors were dispensed with on December 31, 1918. All data, files, records of all kinds properly belonging to the Advisory Committee on Tankcars which had been accumulated by the Supervisors of Rail Transportation during their short term of operation were ordered, under resolution of the Advisory Committee on Tankcars, destroyed.

Oil Ferry Over Ocean

Petroleum and its products—more than 80 per cent of which for the Allies came from American refineries—had to be ferried across the Atlantic Ocean. The tankers were the real ferries. It must be recalled, too, that for the crude oil from the Mexican wells the tankers were its "pipeline" to the Atlantic Seaboard refineries.

Many tankers had been sunk before the United States entered the war; some of them were American-owned, even though they flew the flag of another country. Not a few, though, were deliberately sunk, while the United States was still a neutral, and the tanker was sailing under the American flag.

When the United States entered the war in the spring of 1917 the demand for tankers particularly to replenish the stock of fuel oil in Great Britain was urgent and immediate; and there was soon an added call as fuel oil had to be transported overseas to supply our own destroyers, and submarine chasers, as fast as they began work with the Allied fleets.

At the outbreak of the war in August, 1914, the total tank steamer tonnage afloat was 1,292,496 gross tons. Tank steamers under construction amounted to 250,870 gross tons, or altogether, afloat and under construction, 1,543,366 gross tons. This tonnage was made up as follows:

Country—	Afloat	Under Const.	Total
Great Britain ..	620,852	131,628	752,480
United States ...	420,614	41,898	462,513
Holland	72,715	16,205	88,920
Norway	69,735	39,389	109,124
Germany	8,224	14,880	23,104
Other countries..	100,356	6,869	107,225
Total	1,292,496	250.870	1,543,366

Shortly after the entrance of this country into the war—or in June, 1917—the American tank steamer tonnage afloat was approximately 700,000 gross tons. The British tanker tonnage afloat amounted to about 1,020,000 gross tons. So the proportion of tanker tonnage in the two countries was substantially the same as in 1914.

British Appeal Answered

At this time, in June, 1917, the British Government requested the immediate transportation of an amount of petroleum products across the Atlantic Ocean as would call for 133,000 gross tons of tanker tonnage for its carriage. The British Government said that these products were absolutely and immediately necessary to bring its oil reserves to the safety point, and that all the transportation would have to be provided by America—which put a very heavy load on the American tankers.

To appreciate what this appeal for additional tanker tonnage meant to the American industry, it must be borne in mind that the American tank steamer fleet had not been built for the purpose generally of commerce with the world markets; but had been built primarily as a so-called floating pipeline for the purpose of transporting crude oil to the refineries; and their distributing the finished products coastwise along the Atlantic and Pacific Seaboards. The British tonnage was built primarily for conveying products to the world markets—and no refineries depended upon these British tankers to provide them with their crude oil supply.

Therefore, any reduction in the American tank steamer tonnage correspondingly affected the refineries' supply of crude oil—and in addition put in jeopardy the operation of the refineries, since it tended to promote a congestion of the finished products at the refineries. The British Government did help out in this extremity. It sacrificed some cargo space urgently needed for foodstuffs and munitions and loaded fuel oil in the ballast tanks and double bottoms of these cargo vessels.

Fuel Oil Need Met

Fuel oil requirements for overseas shipment increased at this time 100 per cent. The British Admiralty had received from the Gulf refineries up to this time 100 per cent of their American fuel oil. Now it was necessary for the northern group of refineries at Baltimore, New York and Philadelphia to make changes in their equipment and manufacture fuel, which they had not done before, not only to provide increased amount necessary but in order to have the fuel oil where the tankers could take it on and make the shortest time run to Great Britain and France. So the British tank steamers, already fitted with guns, stopped operating on their 70 day voyage from the Gulf, and saved not only the 20 days difference in time necessary to make the round trip but saved 20 days bunker oil; and thus was enabled to deliver increased cargoes in England.

Other American tank steamers were placed in the coastwise service from the Gulf refineries to the north Atlantic ports. During the month of October, 1917, the fuel oil shipments increased 100 per cent over the shipments made at the time the appeal for assistance was received.

The crude oil refining capacity in actual operation east of the Rocky Mountains was divided approximately equally between the interior refineries and the refineries located on the Atlantic and Gulf Seaboards.

Seventy per cent of the refining capacity of the United States is east of the Rocky Mountains. Fifty per cent of this—or say 35 per cent of the crude oil refining capacity of the United States in actual operation—had to provide approximately 90 per cent of the overseas requirements for both military and commercial purposes. As the overseas requirements of the United States and the Allies were supplied to the extent of 80 per cent by the United States, it may be said that 72 per cent of the direct overseas war requirements were supplied by the Atlantic and Gulf Seaboards refineries. Or 35 per cent of the crude oil refining capacity in the United States in actual operation supplied nine-tenths of our and our Allies' war requirements abroad—but in addition supplied an equal or greater proportion of the domestic petroleum war requirements.

Mexico Out of Reach

At this time there was plenty of crude oil in Mexico but this country couldn't get it because of the shortage of tank steamers. The United States exported to Great Britain, France and Italy, in 1914—in which there was a half year of war—more than 1,026,000 tons of fuel oil and 285,000 tons of gasoline and naphtha. In our first year in the war, this had gone to 2,430,600 tons of fuel oil and 805,000 tons of gasoline and naphtha. At least 3,000,000 tons of fuel oil was exported to these three countries in 1918, as well as 1,286,456 tons of gasoline and naphtha. This represented an increase of 200 per cent in fuel oil over 1914; and 23 per cent over 1917, the year this country entered the war.

Had the war continued during the year 1919, there would have been an enormous increase in the export of all these commodities particularly motor gasoline and aviation naphtha; 2,400,000 tons of gasoline and aviation naphtha would be a safe estimate for 1919, an increase of 100 per cent over 1918 and 1,000 per cent over 1914.

The delay in the aviation program as adopted by the United States Government for 1918 materially reduced the demand during that year, for overseas shipment of aviation naphtha. Besides, the maximum expansion of motor trucks and tractors for artillery purposes was not felt in 1918.

The situation in June, 1917, was rather alarming. Where tank steamers normally completed a round voyage from the north Atlantic ports, such as Philadelphia and New York, to English or French channel ports in about 34 days, and from the American Gulf ports in 46 days, the convoy program—which had been adopted at this time, though not perfected—increased the time of voyage from the northern ports to 50 to 55 days and from Gulf ports to 70 to 75 days. It was therefore evident that from the nearest source of supply—the United States—if one-half the petroleum products were shipped from north Atlantic ports, and one-half from Gulf ports, at least one-half as much again additional tonnage would be required just to transport the same quantities as heretofore—exclusive of the new tonnage required for the movement of the increased supplies.

Voyages Took More Time

This increase in the time of voyage wasn't confined to any particular part of the globe. In fact, the greatest increase was on shipments from the Dutch East Indies to Italian and French Mediterranean ports, and on the shipments of Borneo naphtha to England and France for the manufacture of toluol. A tank steamer on this run did not average more than two and one-half voyages a year.

By November, 1917, the American tanker tonnage engaged in direct overseas service equalled 30 per cent of its total tonnage or 220,000 gross tons. In addition to this 23 per cent of the tank steamer tonnage under the British flag in this service was American owned. So that 51 per cent of the total tankers in service between here and Great Britain and France—or 373,000 tons—was American-owned and 49 per cent was British-owned.

But only 30 per cent of the British tonnage was in the direct war service between the United States and England—with an additional 3 per cent serving France—or a total of 33 per cent, and this notwithstanding the fact that 80 per cent of the total petroleum requirements of the United States Government and the Allies had to be supplied by the American oil industry. (This was estimated at 630,000 tons monthly.) The schedule made for carrying this across the Atlantic Ocean indicated a minimum tanker tonnage of 945,000 gross tons. As a matter of fact, there were only 727,450 gross tons actually engaged in this overseas service.

This was, of course, a grand total of approximately 1,750,000 gross tons, at this time, of British and American tankers. But fleet tenders and other war service such as the transportation of naphtha from Borneo for toluol manufacture, the transportation of molasses for explosives, as well as the transportation of other supplies, required the services of 67 per cent of the British tanker tonnage.

Double Task for U. S. Tankers

The situation which the American tanker tonnage faced was a different one from that facing their British brothers. The American tanker had to transport crude oil to refineries, and then transport the finished products of these refineries on a short run. If the refineries did not get sufficient crude oil they could not turn out adequate supplies for war purposes, which would be fatal. Therefore the refineries had to receive a regular and sufficient amount of crude oil, and the finished products had to be removed from the refineries to avoid congestion.

Fortunately, the American oil industry had realized, soon after the commencement of the war in 1914, the necessity for providing additional tanker tonnage. Otherwise the war might have ended disastrously for the Allies; or at least have been greatly prolonged.

On December 12, 1918, the total tank steamer tonnage afloat amounted to 2,872,592 gross tons, an increase of 122 per cent over the tonnage afloat in 1914. In addition there were 663,700 gross tanker tons under construction—or 3,536,292 gross tons afloat and under construction. This was an increase of 133 per cent over 1914.

ALL THAT FLOWS NOT GOLD AT SEMINOLE

(Continued from Page 187)

wells to each drilling operation, and later when this source was found inadequate, private water systems were constructed from a fork of the Canadian River to the field. In constructing these systems, purifying processes were used to free the water of impurities, for the water was used at camps for cooking and drinking purposes. The largest water system installed in the field cost $300,000, and compares very favorably with the municipal system of any small city.

Drilling Cost of a Well

Examine the drilling cost of a well 4,127 feet, a well which may be regarded as average in the field:

Rig	$7,525
Casing	14,874
Freight, teaming and hauling	2,065
Drilling	33,016
Fittings	500
Misc. labor and supplies	900
Total	$58,880

This well when completed produced 100 bbls. daily of oil which sold for $1.34 per bbl. Not an encouraging proposition.

Take the cost of a lease in Seminole City, one of the oldest leases in the field. After oil was found, the title was attacked. Consider the entries on the owners books:

Drilling and equipping 12 wells....	$660,000
12 Compressors and air lift apparatus	151,748
Small tanks (built during bad weather)	98,552
Other construction and equipment.	52,825
Direct lease expense and litigation (defending title)	77,000
Total	$1,040,125

After the first rush to acquire lease holdings in the new field, there naturally was a lull in trading. After the old Seminole City pool had been producing for several months, many drilling propositions were rejected by companies, because heavy bonuses, or free wells were asked by the owners as part of the consideration. After contemplating the production of the older parts of the field, and realizing that a recovery of 12,000 to 14,000 bbls. to the acre would be required before the original investment would be returned, the deals were generally turned down.

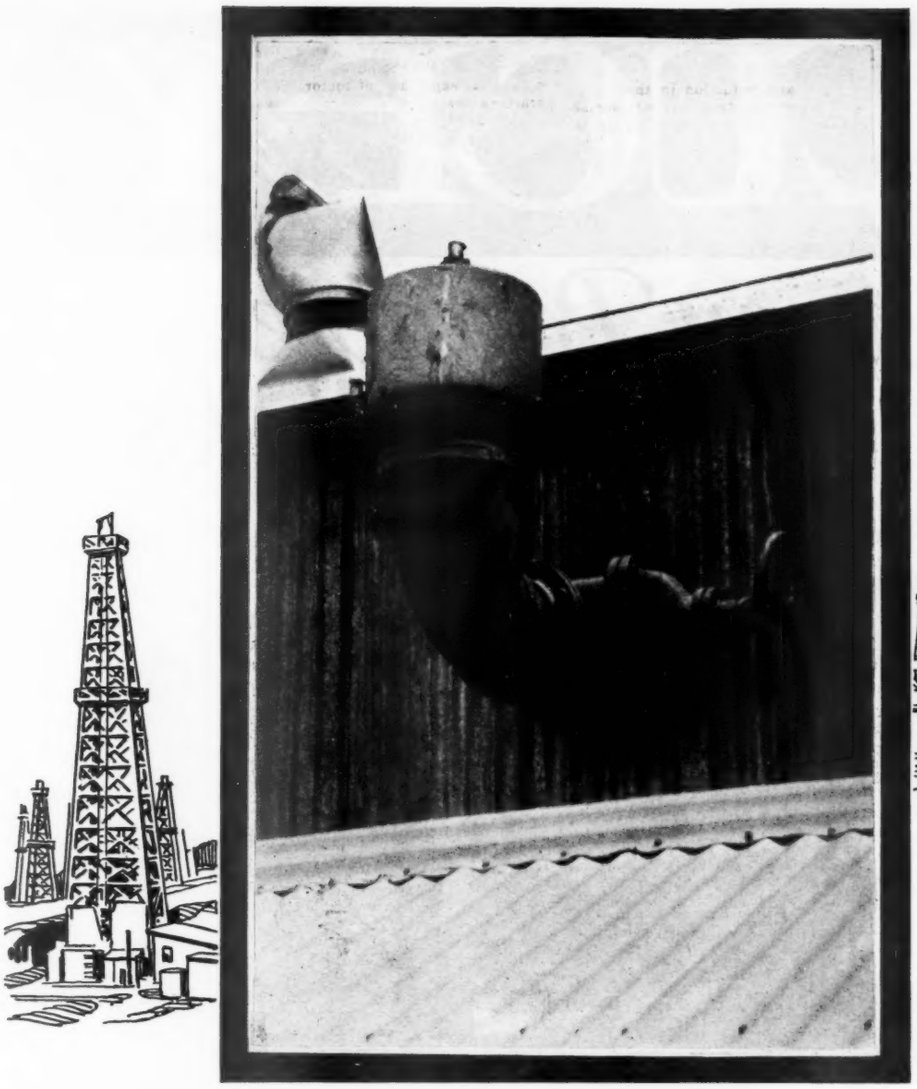
Altogether Different

The abnormal drilling activity experienced in this field, was totally different from other major pools. The general practice in other fields was to slowly extend the rigs, and rotate the drilling tools from one location to another as rapidly as the wells were completed, if the newly discovered production justified the activity.

At Seminole, a company would decide to drill six or even eight wells simultaneously, owing to a similar program being adopted across the fence, and also due to the drainage which the very porous sand condition caused. In order to accomplish this drilling contractors were obliged to purchase several strings of tools if they did not already have them, and owing to the rapid advance in work, it was found impossible to rotate the drilling equipment. Two strings of tools were required, one rotary, and one cable string, and now that drilling is on the wane, several hundred strings of tools are idle in the field, and are slowly turning to rust. The investment in idle tools at Seminole today is estimated at $3,000,000.

HANDICAPPED BY LAW

If it is found desirable to restrict activities during periods of overproduction in the oil fields, I believe much could be done by restricting drilling through agreements, if it were not for the fact that such agreements would be a violation of our existing laws. In the past these laws have prevented even the discussion of this subject between competing operators.—Thomas A. O'Donnell.



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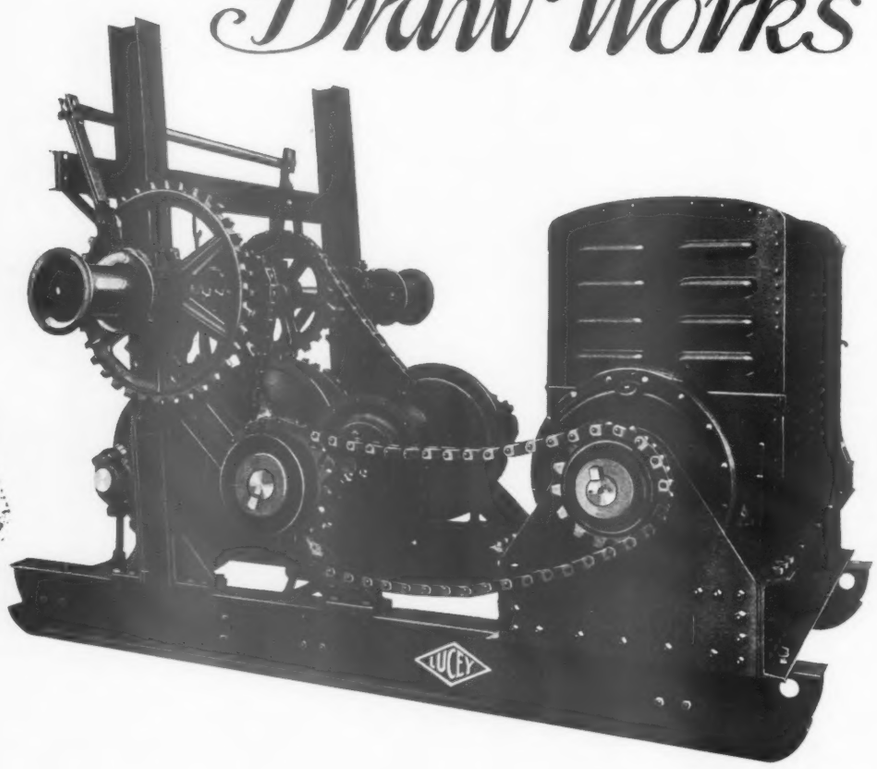

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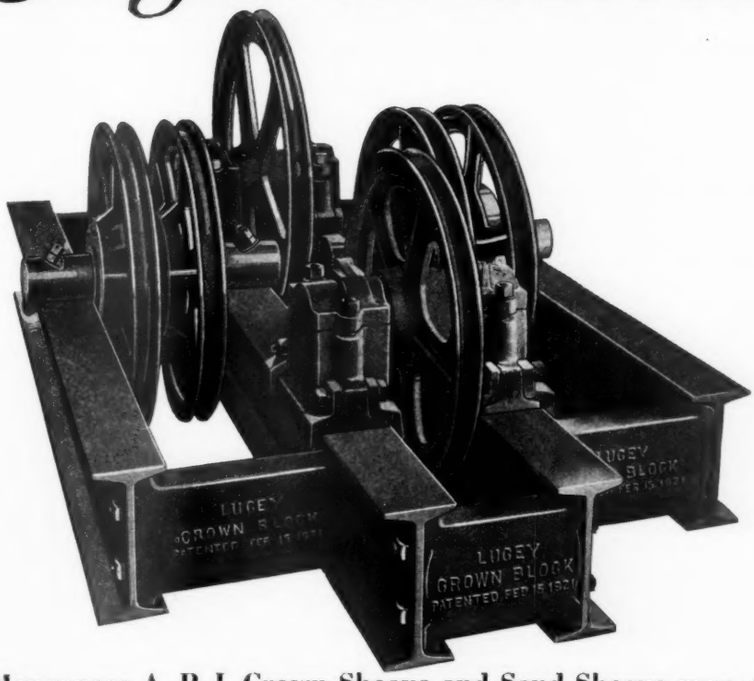

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More to Drilling Than Boring a Hole

What Goes Before the Finding of Oil? Method of Drilling Described and Explained for the Layman

By J. L. Dwyer

In this day and age of concentration and specialization, every oil company playing an important part must have its geological department. This department is charged with selecting the most favorable parts of the country, and then giving the selected part a thorough exploration. The work of the geological surveying party is really the first preliminary in the work of finding oil.

The geological party drives to the town close to the area under examination, and for a few weeks, goes over the land. Rock outcroppings are closely examined by these trained scientists and every evidence of difference in the position of the rocks is studied and charted with the aid of their instruments. A geological map of the surface conditions as revealed by these outcroppings is made and filed in the main office of the oil company. This work alone runs into a considerable amount of money for salaries and expense for the parties making the survey.

Should the company be impressed with the prospects, the land man plays the next role in the oil business. The land department has a force of men trained in negotiating, and it is their duty to visit the area and purchase the leases from the land owners. The average oil and gas lease taken today runs for a term of 10 years, and, aside from the bonus which is paid, provides for an annual rental of $1 per acre for each year of the lease.

If, after a number of leases have been taken, the company decides to drill a test well the engineering department comes into action. The type of derrick is decided upon by the engineering and production departments, and after selection of a site, a crew of surveyors establish the spot which the geological department has picked as the location for the well. In times gone by many errors have been made in locating wells, and there have been instances where the well was situated upon the wrong land. To prevent this competent surveyors are now used to make all oil well locations, and of course it costs money.

Building the Derrick

With the location stake driven into the ground, the rig is next hauled out from the closest railroad, and the engineering department provides the specifications for the rig foundation. The derrick is due to support extraordinarily heavy weights, and it must be firmly set. In cases where soft surface conditions are found solid rock must be located before the concrete corners upon which the derrick rests are set. In cases where rock is found at the surface, it must be blasted out in order to permit the cellar of the rig to be put in, for all strings of casing are hung upon clamps which rest upon casing sills, (heavy timbers 8 inches by 8 inches) and much work is done in the derrick cellar.

With the foundation properly provided, the crew of five rig builders starts work upon the derrick. An average of three days is necessary for the five men to complete the 110-foot structure which is most used today. In addition to the derrick proper, auxiliary rig equipment of engine house and foundation, the walking beam if the well will be standard tools, and miscellaneous small equipment must be in place before the tools can be brought in.

The matter of providing the proper amount of water, and fuel for drilling activities next engages the attention of the engineering department. The rotary system of drilling requires considerably more water than the cable tool system. If water is in abundance in some stream 2 miles away, proper arrangements must be made to secure a sufficient supply; and the engineers must figure the proper size pump to transport the water from the stream to the drilling location.

The difference in the elevations must be considered, and a pump of sufficient horsepower to raise the water if it is obliged to travel up hill must be obtained. A large water tank must be placed at the site of the well, and the usual custom is to have at least three days' water supply in reserve in the tank.

The matter of boiler fuel for drilling operations is next. The most desirable fuel for this purpose is natural gas, but in the case of wildcat ventures, this is not always available. Fuel oil may be decided upon as the proper fuel, and if this is the case, burners suitable for this fuel must be placed in the boilers, and a fuel tank built to store the oil. If gas is available gas lines of suitable size and construction must be built by the oil company to bring the gas to the well.

When these matters have been attended to, the rig is then ready for the introduction of the drilling equipment.

After the completion of the rig, the drilling contractor brings his tools to the well. If they are standard tools, three full days' work by a double crew of two drillers and two tool dressers are required before the string is properly rigged up. In using rotary tools, about eight men are necessary for a period of four days before the mud pumps are set, and the tools properly rigged up.

Spudding

When the well is fully rigged up, actual drilling takes place. The upper part of the hole is spudded by lifting and lowering the tools alternately until a sufficient depth (usually 200 feet) is reached. After spudding, the regular work of drilling is entered into, and the crews work 12 hours each, running from midnight to noon and noon to midnight. In the upper part of the hole, the usual speed of drilling will average about 100 feet per day with cable tools, and with rotaries slightly more.

At a certain depth down the hole, a string of casing (pipe to line the hole) will be run for the purpose of shutting off a body of water which has been struck or else for getting the drill past a cave which continuously brings shale into the hole and impedes the work.

When the casing is being run, a set of specially designed tools for handling it are used. The collars of each individual joint of casing are lubricated to prevent any trouble in the threads, and the joints are screwed together, and then lowered down into the hole until the bottom of the hole is reached by the pipe. A perfectly cylindrical hole, dry, is furnished after cementing has been accomplished.

When the casing is almost run, the cementing crew is called. Specially equipped motor trucks carrying mixing tanks and high pressure pumps are brought to the well, and a mixture of cement, sand and water is made, and forced down the hole by means of the pumps. It is usually placed so that the lowest joint of casing will set completely in cement. Various admixtures are used to accelerate the setting of the cement, and the well is usually allowed to remain idle 10 days before drilling is resumed. This is for the purpose of permitting the cement to set thoroughly.

After the necessary period has elapsed, drilling is again resumed and the portion of the hole inside of the casing which has filled up with cement is drilled out.

To return to the well, it has been assumed that it is flowing. Should the flow cease, either one of two methods must be used to continue the production of oil from it; the pumping system, or the air-gas lift system.

Pumping a Well

If pumping is decided upon, a string of tubing having a 2 or 3-inch diameter is run to the bottom of the well. The smallest string of casing in general use has a 5-inch diameter, and there is a margin between the casing and the tubing.

The tubing is suspended from the top by clamps, and the bottom of the string is reasonably close to the producing sand. Inside of the tubing is placed a string of rods, connecting with the working barrel which performs the actual work of lifting the oil. At the bottom of the working barrel is a valve which permits the fluid to enter the barrel. This is called the standing valve. Attached to the rod string, is a series of valves and cups which travel up and down alternately lifted and lowered by the action of the rods. The oil entering the working barrel, is checked from returning to the sand by the lower valve, and is lifted by the traveling valve, moving up the tubing string until it reaches the top of the hole from which it enters a lead line, a string of 2 or 3-inch pipe. The lead line takes the oil into an oil and gas separator, and from there it takes its place in the stock tank.

If the air-gas lift system is contemplated, the most satisfactory action is to engage a competent engineer; which is not always done. Producing oil by means of the air-gas lift is a technical problem, and one in which local conditions govern the best results. What might be highly efficient upon one well, is likely to result in disaster upon a well a few hundred feet away.

Air-Gas Lift

Producing oil by air-gas lift, necessitates first, a good column of oil standing in the hole. An engine and compressor must be installed, and sufficient volume of air or gas (gas is mostly used) must be sent down the hole either through the tubing or through the casing to lift the oil. The gas must be at the correct pressure and the volume must be enough that it will exert its greatest working energy. If too much gas is sent down the hole, it will blow the column of oil out of the hole, and after that, the gas will merely blow unrestrained to the casinghead, lifting no oil with it. If insufficient gas is introduced, it will not lift the oil.

The gas being compressed has a certain working energy, and when released at the bottom of the well, the gas globules mix with oil globules, and as they mix, they lift the fluid to the top of the hole. In removing the oil from the hole, a certain amount of gas which is present in the oil sand will be removed with the oil and compressed gas. In order to determine just what amount of gas is coming from the sand, the gas input and the gas output of the well are both measured, and recorded. For instance if 5,000,000 cubic feet of gas per day is being put into a well, and 6,000,000 cubic feet of gas per day is being removed, the gas which originates in the sand must be 1,000,000 cubic feet per day.

An operating engineer watches charts which mark the performance of each unit of the air-gas lift plant, and also observes the output of the well. Any variation in the output of the well is immediately checked by him and the cause determined.

In using air-gas lift, many innovations have been introduced, and the principal one has been the elimination of any right angle bends in the lines which run from the casinghead to the oil and gas separators. Former practices included a right angle turn at the top of the casing, another at the riser where the line changed its position from a horizontal to a vertical course, and still another where it entered the separator, and changed back to a vertical course once more. In each of these bends, resistance was formed by the sharp turn, and modern practice has caused a 45-degree fitting to be placed in the top of the casinghead, and another at the place were the flow line enters the separator. Sometmes these connections are welded. The sloping course of the flow line from the casinghead to the separator eliminates the resistance formerly caused by the sharp bends, and the output of the wells is believed to be greater by this method. As the fluid level in the hole becomes lower, the tubing must be lowered correspondingly.

A rather elaborate system of charts and records is desirable in using the air-gas lift, and this system of producing, while causing a very heavy expense per well, recovers the crude oil much more rapidly than the pumping method, as well as bringing less water into the hole, and where large amounts of water are already present in the hole, handling this fluid is a very easy manner.

In the opinion of many, the air-gas lift is the production method of the future.

Drilling

At various stages of drilling, samples of the formations through which the drill has passed are taken from the well, and subjected to a microscopic examination by a force of trained scientists who specialize in paleontology with a view to ascertaining the position of the formations with relation to other wells which have been drilled. This is the subsurface geology which has come into prominence within the past few years.

When the tools become lost, or broken the drilling contractor must "fish" for or find them in the hole, and remove them before any further progress may be made. Oftentimes several strings of tools are lost in the same hole, increasing the difficulty of removing them. This has a disastrous effect and very often ends with the drilling contractor taking bankruptcy. The average time spent in fishing on wells in the Seminole Field of Oklahoma where a good knowledge of underground conditions was available was 11 days per well, and in the case of wildcat ventures this figure must be greatly multiplied. The worries of fishing are enough, but in addition comes the expense.

When the sand which is expected to produce oil is reached, the usual practice is to set a string of casing on top of it. After this casing is set and the necessary time taken for the cement setting, preparations to drill the well in are taken.

Controlling the Well

A control head, an iron device which screws on top of the casing, is placed in position. It contains a metal top which operates on a shaft running through the diameter of the casing, and it may be operated by hand from the outside. Its purpose is to shut off quickly by a single turn, any flow of oil or gas which comes out of the casing.

An oil saver, a tool which snugly fits the casing top, may be used. This is a piece of equipment having a hollow space the size of the drilling line. The space is surrounded with rubber liners which may be adjusted to any desired tension upon the drilling line. When drilling in the well the rubber liners are fastened sufficiently close to the line to allow it to move up and down with the strokes of the beam, and yet permit no oil to escape.

Oil storage tanks are erected close to the well, and flow lines coming directly from the well head to oil and gas separators are usually welded into place. The oil and gas separator is a cylindrical shaped vessel which performs the function of separating the oil from the

(Continued on Page 210)

Work That Means Power, Smooth Running, Added Wealth

In Oklahoma's oil fields are men whose work is vital to the whole Nation—to people far beyond America's limits, too. Oil today is generating power, providing heat, keeping industrial machines efficient, speeding production, cutting costs—opening the way to new advances in progress, in fact.

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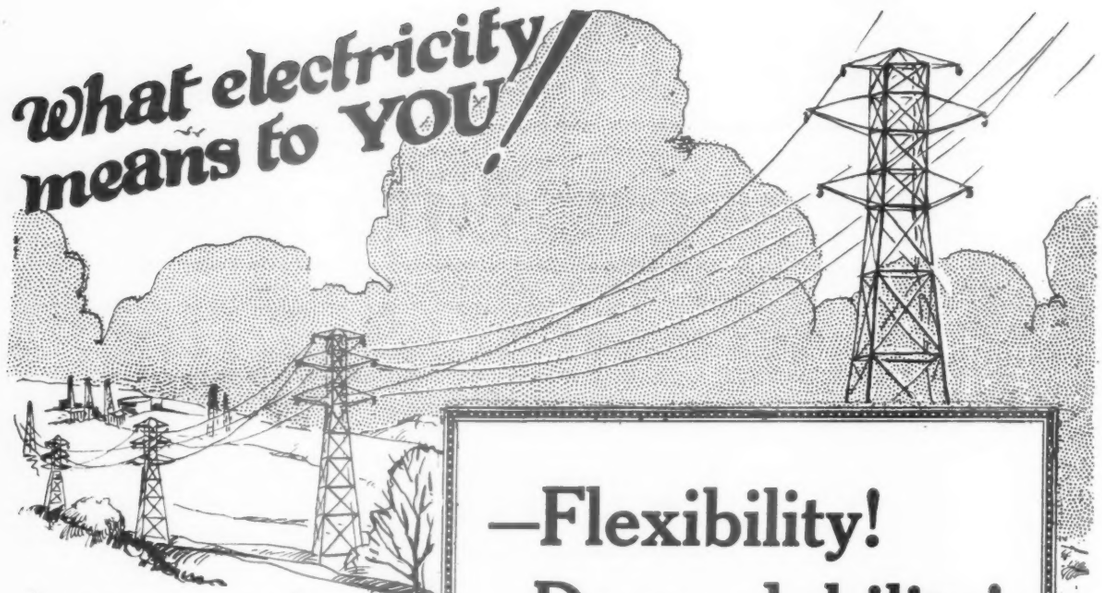

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How Industry Has Conserved Oil

Instead of "Waste" Every Effort Has Been Successfully Used to Effect Economies in the Use of Petroleum

By Charles E. Kern

The frequent references to "waste" in the oil industry has produced on the public mind a very erroneous conception of the manner in which petroleum and its products have been handled. There is absolutely no use of the word "waste" in the ordinary sense of loss.

These facts are known to every oil man, but unfortunately it is not the oil industry that is wholly discussing and contemplating control of its products. There is a large field for educational work in respect to the manner in which the industry is conducted and the degree to which conservation has been carried.

The only element of "waste" under any possible interpretation of that word might be in connection with methods of production forcing competition by the drilling of unnecessary wells and methods of handling oil. It is perfectly well known that these methods have been forced upon the industry by the Sherman Antitrust Act which threatens the prosecution of numerous owners of an oil field if they should combine to pool their interests and operate the field according to the best principles that have been devised and urgently recommended by government agencies. To completely remove that kind of "waste" it will be necessary to modify the antitrust law, although within its restrictions the industry itself has gone a long way toward the introduction of rational methods in the development of an oil field.

Important Facts

The important facts showing to what extent the oil industry itself has undertaken to provide the public with production to meet market demands without "waste" have not been grasped outside of the industry itself. The day when an unconsumable product, such as gasoline, was thrown away because there was no market for it, has no counterpart at this time. The genius of the refinery has succeeded in using every element of crude oil and in the case of the cracking process has performed the hitherto unheard of task of changing one grade of oil into another, to make the supply conform to the demand.

James H. Westcott, a lawyer of New York, for his own information some time ago made a careful study in respect to the "waste" of the oil industry and he came to the conclusion that the word "waste" was an absolute misnomer when applied to this industry. On the other hand the highest degree of conservation has characterized the attitude of the industry toward its product so far as that has been possible.

"The cracking processes alone are conserving for future use," says Mr. Westcott, in a privately prepared statement, "over 1,100,000 bbls. of crude oil a day. In July, 1927, the refineries in the United States produced 8,355,000 bbls. of cracked gasoline or 269,516 bbls. a day, compared to a production of 17,121,000 bbls. of straight run gasoline, or 552,290 bbls. a day. In order to produce this straight run gasoline, 71,901,000 bbls. of crude oil were refined and it yielded 1 bbl. of straight run gasoline for each 4.2 bbls. of crude oil. So if no cracked gasoline had been produced, an additional 1,131,967 bbls. a day of crude oil would have been required in order to have produced straight run gasoline equal to the amount of cracked gasoline, or at the rate of 413,167,955 bbls. of crude oil a year.

Loss Avoided

"The refinery consumption of such an additional amount of crude oil would have been a distinct economical loss or waste. It would have resulted in an overproduction of fuel oil, gas oil, kerosene and lubricating oil amounting to over 400,000,000 bbls. a year. It would have consumed all the crude oil stocks in the United States in one year.

"Had it not been for the cracking processes, the refiners of crude oil would now be running large quantities of fuel oil into the rivers and creeks unless it was sold at substantially reduced prices or further uses and demand created.

"The growing importance of the cracking processes and the conservation of crude oil through their operation are shown by the production figures for the past few years. Unfortunately, all figures are not available but may be supplied within a few months:

"Year of 1921: Cracked gasoline produced, 19,000,000 bbls., estimated; conservation of crude resulting, 79,800,000 bbls.

"Year of 1925: Cracked gasoline produced, 68,583,000 bbls., reported; conservation of crude resulting, 288,048,000 bbls.

Year of 1926: Cracked gasoline produced, 93,736,000 bbls., reported; conservation of crude resulting, 393,691,200 bbls.

"First seven months of 1927: Cracked gasoline produced, 57,246,000 bbls., reported; conservation of crude resulting, 240,433,200 bbls.

"But this conservation of crude oil now at the rate of 413,167,955 bbls. a year and which must continually mount to higher figures owing to the ever increasing demand for gasoline and the increasing production of cracked gasoline, is not the growth of a few years.

"The present enormous conservation of crude oil by the use of cracking processes is due somewhat to the elimination of former waste of a part of the cracked gasoline. This gasoline contains as high as 20 per cent of unsaturated hydrocarbons which were formerly thought to be deleterious ingredients and which were removed by strong acid treatments. But within the past few years the unsaturated hydrocarbons have been found to possess important antiknock qualities and they are no longer destroyed or removed from the raw cracked gasoline.

Saving of Former Losses

"A saving of former losses which probably averaged 15 per cent of the cracked gasoline some years ago is now made. Based on the July, 1927, production of 269,516 bbls. a day of cracked gasoline, a 15 per cent saving would amount to 40,427 bbls. a day or at the rate of 14,755,855 bbls. a year. That would represent the consumption of 61,974,591 bbls. of crude oil in order to produce the same amount of straightrun gasoline. It is an economic saving or conservation of the natural resources, petroleum, and it has been entirely due to the progress made by refining companies in the treatment of cracked gasoline.

"The improvements in cracking processes have resulted in another important saving by decreasing the production of noncondensible gases made during the cracking operation. While it is not yet possible and may never be possible to condense all the gases produced during cracking, a decided improvement has been made through the use of continuous cracking processes.

"Improved refinery practice and efficient condensers have resulted in the reduction of the amount of noncondensible gases made in the distillation and cracking processes. The actual losses in cracking gasoline have been reduced to around 5 per cent by the newer processes, compared to losses up to 10 per cent some years ago.

"The manufacture and use of cracked gasoline has resulted in a superior grade of gasoline and more efficient products which are sold at lower prices.

"The next greatest development in the petroleum industry during the past 16 years has been in the recovery of natural gasoline from wet natural gas. The extent of this conservation of a natural resource is shown by the increased production of natural gasoline from 483 bbls. a day in 1911 to 29,350 bbls. a day in 1921 and to 100,615 bbls. a day in July, 1927, or at the present rate of 36,723,745 bbls. a year.

Natural Gas Conserved

"Based on the July, 1927, recovery of 1 bbl. of straightrun gasoline from each 4.2 bbls. of crude oil run through the refineries, the present production of natural gasoline means an economic saving of 154,239,729 bbls. of crude oil a year. The saving is even greater as natural gasoline averages over 20 degrees lighter gravity than straightrun or cracked gasoline.

"The economic value of natural gasoline is extremely important to the public as the ever-increasing demand for motor spirits has been met to some extent by the utilization of the heavier fractions of gasoline and the lighter fractions of kerosene. Through the use of natural gasoline, grades of motor spirits can be produced running from 58 to 72 degrees Baume. Natural gasoline has efficient pick up qualities on account of its volatility and it is reported to have important antiknock qualities.

"Remarkable progress has been made in the manufacture of natural gasoline not only by the installation of permanent natural gas plants in the various oil and gas fields, but through the development of portable natural gasoline plants. These portable plants save much of the gasoline contents of the flush gas in new oil fields which were formerly wasted until permanent plants involving a substantial investment could be erected. The construction of permanent plants is usually delayed until sufficient data is obtained through the development of an oil field upon which to base the capacity of a permanent gasoline plant.

"The production of natural gasoline which increased by 20.3 per cent in 1926 over the 1925 production in the face of an increase of only 1.7 per cent in the production of crude oil, was partly due to the saving of natural gasoline by the portable gas plants from the flush gas of the oil wells. Important savings of gasoline bearing gas are also made by the use of gas traps on oil wells which separate the natural gas from the oil.

"Natural gasoline is also being recovered from the wet gas in gas fields before the resultant dry gas is used for fuel and other industrial purposes.

Improved Devices

"Important reductions of former losses of this natural resource, petroleum, have been effected by the many improved devices installed in the up-to-date refineries and the construction of new refineries of larger capacity and greater efficiency which produce better products.

"The former usual type of single cylinder or batch stills were operated intermittently and were wasteful of refined products. A large number of them have been replaced by continuous stills into which oil is fed continuously and the still bottoms withdrawn without interruption. Batch stills are principally used now when running lubricating stocks and in reducing neutral stripping naphtha or gasoline from bright stocks. The efficiency of batch stills has also been increased through better construction. Many batch stills have been built recently to resemble horizontal boilers, which allows the gases produced to make another pass. This permits of less loss in the higher volatile elements and gives better fuel economy.

"The evaporation losses from crude oil which carry with them the higher fractions of gasoline and some entrained oil, have run as high as 5 per cent in storage and rundown tanks and during the transportation to refineries when the storage facilities were open to the atmosphere. A substantial part of these losses is now prevented through the use of modern tanks, covering them with light colored paints, insulated, vapor tight, floating or low pitched roofs, gas tight appliances, pressure and vacuum relief valves and vents, breather pipes and gas collecting bags and systems for the accommodation of the natural expansion and contraction of the crude oil and gases under the varying degrees of heat.

Losses Reduced

"While there are always some unpreventable losses in the refining of crude oil, such as the sulphur, sulphur compounds, gum-forming constituents and other impurities in the crude oil which have to be removed to a large extent from the refined products, the net result of the improvements in refinery apparatus and practice is shown in the decreasing percentages of refinery losses per barrel of crude oil refined.

"The saving of 31 per cent in refinery losses in 1924 from those of 1921 came about notwithstanding some increase in the manufacture of cracked gasoline. Such processes always show a much higher loss than ordinary distillation processes and it is doubtful if the most efficient cracking process can show a loss of less than 5 per cent of the amount of the charging stock.

"While the recovery of refined products from tank bottoms involves difficult problems in the separation of the oil from the water and basic sediment, some progress has been made in such recoveries. Tank bottoms show as high as 75 per cent of petroleum and 25 per cent of basic sediment. One company is reported to have 468,000 bbls. of tank bottoms and a 75 per cent recovery would yield 350,000 bbls. of oil. Another company reclaimed 9,000 bbls. of oil from 16,000 bbls. of such bottoms at a cost of 20 cents a barrel.

"Improved processes for the treatment of emulsified oil have resulted in the conservation of crude oil. It is estimated that from 10 to 15 per cent of all Mid-Continent and Gulf Coast production is emulsified and requires treatment before it is acceptable to the pipe lines and can be refined. Several successful methods have been evolved for the treatment of this emulsified oil.

"The petroleum and allied industries, natural gas and carbon black, have made and are making an important economic use of the residue dry gas in oil and gas fields, after the natural gasoline has been extracted from wet natural gas, through the establishment of carbon black factories. Carbon black factories are now producing about 175,000,000 pounds of carbon black a year compared to a production of 51,321,892 pounds in 1920.

"Carbon black factories are established where there is no market for natural gas for domestic or other industrial purposes. They aid in the development of natural gas fields and are moved to other fields when a market is developed for the natural gas for lighting and fuel purposes.

"The construction of gas pipe lines to industrial centers constitutes another conservation of our natural product, petroleum, as the natural gas used in the industrial centers replaces to some extent the use of petroleum products for fuel and lighting purposes.

"The petroleum industry has had very

Factory Branches are located in

Dallas, Texas; Luling, Texas; Borger, Texas; Odessa, Texas; McCamey, Texas; Burkburnett, Texas; Breckenridge, Texas; Ranger, Texas; Houston, Texas; Eldorado, Ark.; Big Springs, Texas; Tulsa, Oklahoma; Pampa, Texas.

THE MARION LINE

Factory Branches are located in

Bristow, Oklahoma; Okemah, Oklahoma; Tonkawa, Okla.; Wilson, Okla.; Eureka, Kansas; Salt Creek, Wyoming; Kevin Montana; Long Beach, Calif.; Bradford, Pa.; Scottdale, Pa.

Mariondyer Speed Spool

Patent No. 1,621,714

MARION SPEED SPOOL

No. 12268 Mariondyer Speed Spool for 16" shaft, complete with chain ..... Wt. 750 lbs.
No. 12269 Mariondyer Speed Spool for 18" shaft, complete with chain ..... Wt. 730 lbs.
No. 12270 Speed Spool Chain ..... Weight 10 lbs.

Write for Bulletin No. 44A.

The Mariondyer Bull Wheel speed attachment consists of a two diameter drum that is attached to the bull wheel shaft to increase the diameter of the shaft to approximately one and one-half and two times the shaft diameter.

Its purpose is to speed up the pulling of tubing and rods.

It is to a bull wheel what a gear shift is to an automobile. It gives power to pull heavy loads and speed as the load lightens.

With this attachment, the maximum pulling speed is attained without speeding up the engine. This means that the well is "off production" the shortest possible time.

The big saving is in the additional oil produced by the time saved in pulling the rods and tubing.

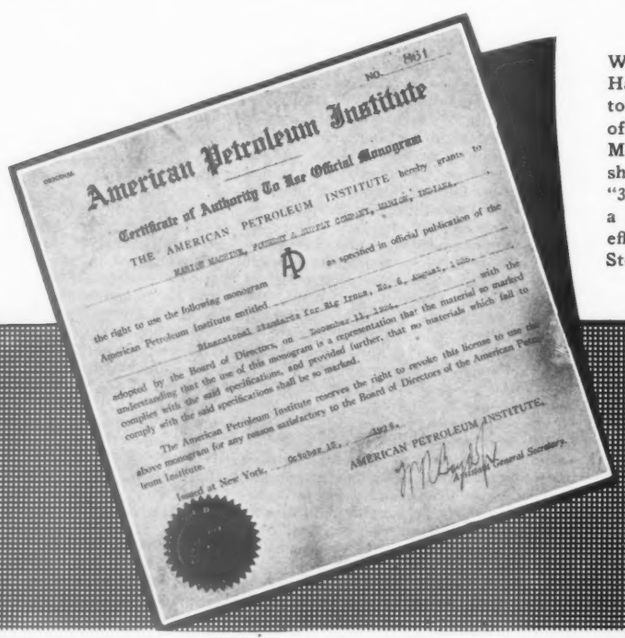
Besides this big saving, there is:

1—Saving in labor.
2—Saving in power.
3—Saving in equipment.
4—Less accidents resulting in fishing jobs and injuries to men.

The attachment is easily and readily attached to the bull wheel shaft and can be moved from one well to another in a short time.

The two halves are hinged together on one side and handled by means of a chain which automatically opens the two halves so they will drop over the shaft readily.

On a 3175 foot well, a rod gang of three men, without the attachment, pulled two wells in a day of nine hours. With the Mariondyer Speed Spool, the same crew pulled THREE wells in a day of nine hours. This means that a well was off only three hours instead of four hours and thirty minutes.



American Petroleum Institute

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Issued at New York, ... 192...

AMERICAN PETROLEUM INSTITUTE,

General Secretary.

We are indebted to Mr. Gus Hallmark, Auditor of the Houston-Doughty Lumber Company of Kansas, for the view of the Marion Tubular Steel Derrick shown on the opposite page. "3300 feet deep and never been a nut tightened" indicates the efficiency of Marion Tubular Steel Derricks.

Vote for the Bulletin or Bulletins in Which You Are Interested

☐BULLETIN NUMBER ONE. Marion Wood Turnbuckle Derricks, Marion Tubular Steel Derricks, Marion Steel Crown Blocks, Steel Foundations, Steel Samson Posts, Steel Jack Posts, All Metal Rig Iron Parts, Marionhill Pitmans, Pipe Pitmans, Oak Pitmans, Steel Walking Beams.

☐BULLETIN NUMBER TWO. Marion Steel Bull Wheels, Marion Steel Band Wheels, Marion Steel Tug Rims, Marion Steel Calf Wheels, Marion Steel Pony Wheels, Spooling Flanges, Journal Boxes, Dogs and Helpers, Bull Wheel Shafts, Calf Wheel Shafts, Marion Bull Wheel Spools, Marion Speed Spools.

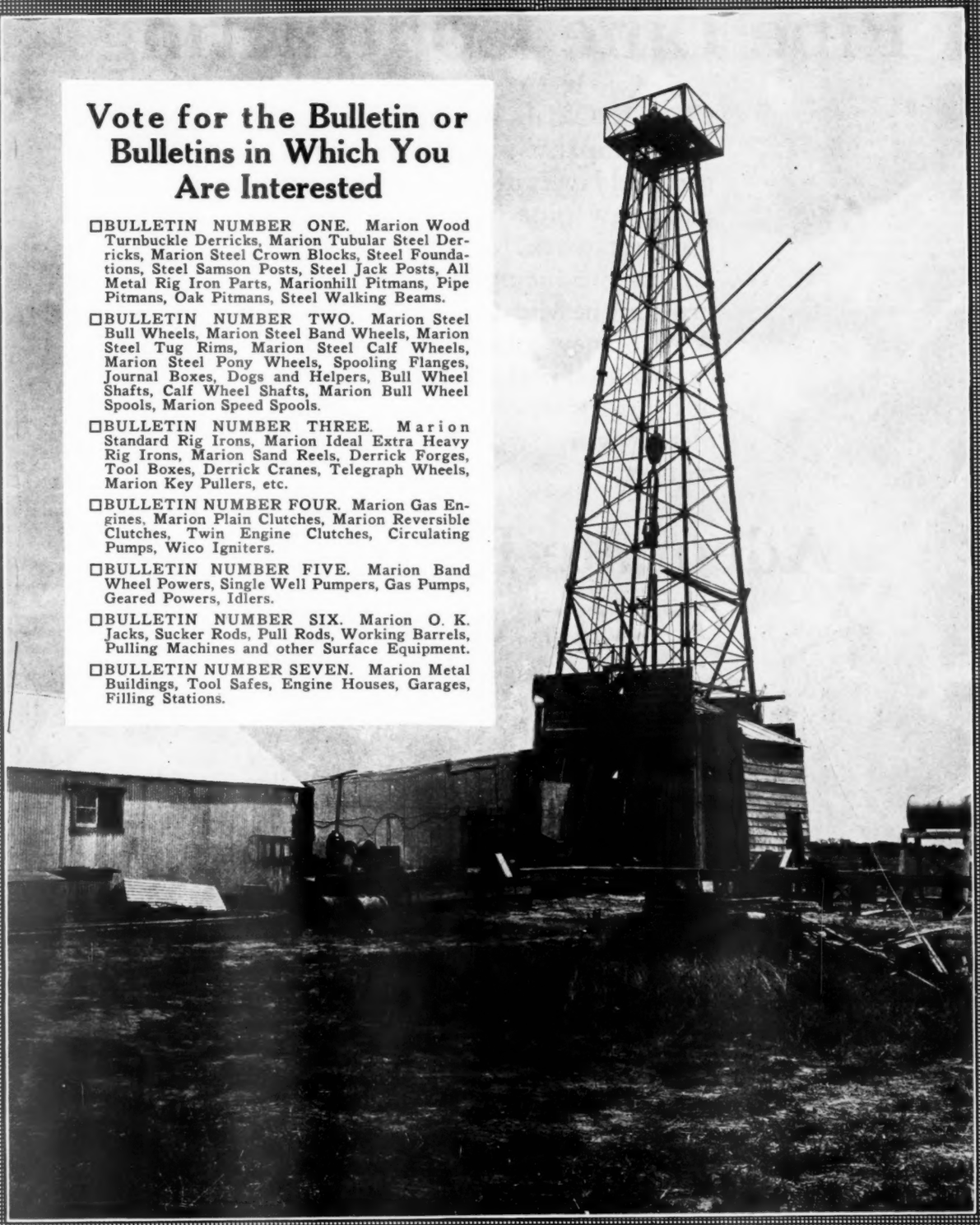
☐BULLETIN NUMBER THREE. Marion Standard Rig Irons, Marion Ideal Extra Heavy Rig Irons, Marion Sand Reels, Derrick Forges, Tool Boxes, Derrick Cranes, Telegraph Wheels, Marion Key Pullers, etc.

☐BULLETIN NUMBER FOUR. Marion Gas Engines, Marion Plain Clutches, Marion Reversible Clutches, Twin Engine Clutches, Circulating Pumps, Wico Igniters.

☐BULLETIN NUMBER FIVE. Marion Band Wheel Powers, Single Well Pumpers, Gas Pumps, Geared Powers, Idlers.

☐BULLETIN NUMBER SIX. Marion O. K. Jacks, Sucker Rods, Pull Rods, Working Barrels, Pulling Machines and other Surface Equipment.

☐BULLETIN NUMBER SEVEN. Marion Metal Buildings, Tool Safes, Engine Houses, Garages, Filling Stations.



Marion Machine, Foundry & Supply Co.
Marion, Indiana, U.S.A.

Pipe Line Contracting

THE Oklahoma Contracting Company, pipe line contractors and layers of welded, Dresser and screw pipe lines, have done contract work for some of the largest producing and refining firms in the Mid-Continent fields. Work on new jobs solicited on the basis of past performance. Names of firms for whom we have completed work will be given on request.

Adequate Equipment for any Size Job

New Warehouse and Office at Dallas.

Oklahoma Contracting Company

T. R. JONES, ***President*** **H. A. GUMP,** ***Vice-President***

The Weldaline Co.

C. J. MURRAY

Tulsa **Dallas**

few waste problems which it has not been able to solve during the last few years. The improvements have resulted in the economic saving of around 574,875,000 bbls. of crude oil a year.

"Not only has the oil industry of the United States developed improvements and processes which are conserving petroleum at this enormous rate, but it has reduced its own operating expenses by millions of dollars a year by improved apparatus and the conservation of heat units.

"The refinery use of fuel has been materially reduced by the installation of heat exchangers and economizers which now utilize the formerly wasted heat units of gasoline and other vapors, hot distillates and fuel gases. Fuel efficiency is now reported at some plants to be from four to five times that of some years ago.

Refining Improvements

"Other improvements in refinery practice have resulted in the elimination to a large extent of hot bottoms in distilling and cracking units, the reduction of corrosion of tubes, stills and agitators, the decrease in corrosion of underground pipes through treatment with asphaltic paints or other substances, the retardation of interior corrosion by a careful selection of materials and the use of acid neutralizing agents, the decrease of carbon deposition and the prevention of localized overheating of stills through the use of steam.

"The conservation of acid requirements is effected through the installation and use of plants for the recovery and concentration of spent acids.

"Standardization of materials has resulted in the reduction of expenses, both in refineries and in the production of crude oil and fires are prevented by the use of foamite.

"Not only has crude oil been conserved by the improvements in refining and cracking stills and the hazard to property reduced, but most important of all has been the conservation of life itself by the improved and newer cracking processes. The original cracking units were notoriously unsafe. Danger from explosion has been materially reduced.

Science Enlisted

"These improvements have kept pace with those in the refining and cracking of oil, as follows:

"Employmnt of skilled geologists and petroleum engineers which has reduced to some extent the hazards in the discovery of few fields;

"Use of water flooding in some fields which has substantially increased the amount of the ultimate recovery of crude oil from the sands. The effect of adding different chemicals in water flooding is now being studied as appropriate chemicals have been found which free the oil film from the sand particles, resulting in a larger ultimate recovery;

"The use of swabs in producing wells increases the present production of petroleum and may increase the ultimate recovery.

"Restoration of gas pressure to the oil in the sands by the introduction of dry gas, is now being practiced and may become one of the outstanding developments of the next few years.

"Most important of all recent improvements in production methods, is the use of compressed air or gas for the flowing of oil wells. It is reasonably certain that their use will increase the ultimate recovery of crude from the oil sands and it does prevent to some extent the infiltration of water into the producing sands and the oil. These lifts are the cheapest of all known methods of producing oil, other than the natural flow, and they have reduced lifting expenses in some cases to less than 25 per cent of the cost of production by the other methods.

"Improvements in pipe line construction have also kept step with those in the other branches of the industry. These improvements begin with the transportation and preliminary handling and cleaning of the pipe and extend into machine ditch digging, the lowering and laying of the pipe, the refilling of the trenches and the treatment of the pipe with hot or cold protective layers for the prevention of rust and other corrosion. The improved methods are used also in the reconditioning of pipe in lines already laid, in order to prevent deterioration.

"The net result of the improvements in the construction of pipe lines consists not only in reduced operating expenses per barrel of crude and the rapid movement of crude oil from new fields to the market thereby causing a quick development of such fields, but also in the substantial reduction in the time during which the capital investment is temporarily unproductive and frozen."

State Gasoline Tax Increase Rapid

Rate of From 2 to 5 Cents Effective in All but Two States. Will Total $240,000,000 This Year

By C. O. Willson

SIX YEAR GROWTH IN GASOLINE TAXES

Total state gasoline taxes in United States based on yearly reports of The Bureau of Public Roads, United States Department of Agriculture.

Year	Total Tax
1922	$ 5,100,000
1923	36,813,939
1924	75,648,510
1925	146,028,940
1926	187,603,231
1927*	240,000,000

*Last half year estimated.

The gasoline tax which is now effective in 46 states will total approximately $240,000,000 in 1927.

This total does not include the gasoline taxes which are in effect in several cities townships and counties throughout the United States. Nor does it include the several million dollars which will be collected from oil companies in the form of inspection taxes. In addition direct taxes are levied upon kerosene and lubricating oils at scattered points in the United States.

This gasoline tax which varies from 2 to 5 cents per gallon in the different states if it was used in the construction of improved highways—the original purpose of the tax—would build two concrete highways extending from New York to San Francisco with a third highway from the Canadian border to the Gulf Coast. It is also equal to about one-third of the interest on the national debt this year.

The $240,000,000 is better than 50 per cent of the entire expenditure made by consumers of gasoline in 1916. Without any increases in the taxes now effective the total tax collected in 1928 will exceed $300,000,000.

History of Tax

The gasoline tax in recent years has had the most rapid growth of any of the numerous taxes imposed on the oil industry. The first gasoline tax to become effective was in 1919 when Oregon adopted a law providing for a tax of 1 cent per gallon. The same year Colorado and North Dakota enacted laws providing for the same rate of taxation.

The following year one more state joined the three. In 1921 twelve states had the tax and during that year Oregon led the way with a 2-cent tax. Legislatures in other states by this time had discovered that the gasoline tax was apparently an easy method of extracting revenue from the oil industry and the consuming public and the tax spread rapidly starting in 1922. There was also a rapid rise in the rate of taxation.

Before the end of 1922 seventeen states had a 2-cent tax and two a 3-cent tax. The following year there were 15 states with a 1-cent tax, 11 with a 2-cent tax, 1 with a 2½-cent tax and 8 had adopted a new rate of 3 cents. In 1923 the revenue exceeded $35,000,000 and the total taxation in 1924 more than double that amount.

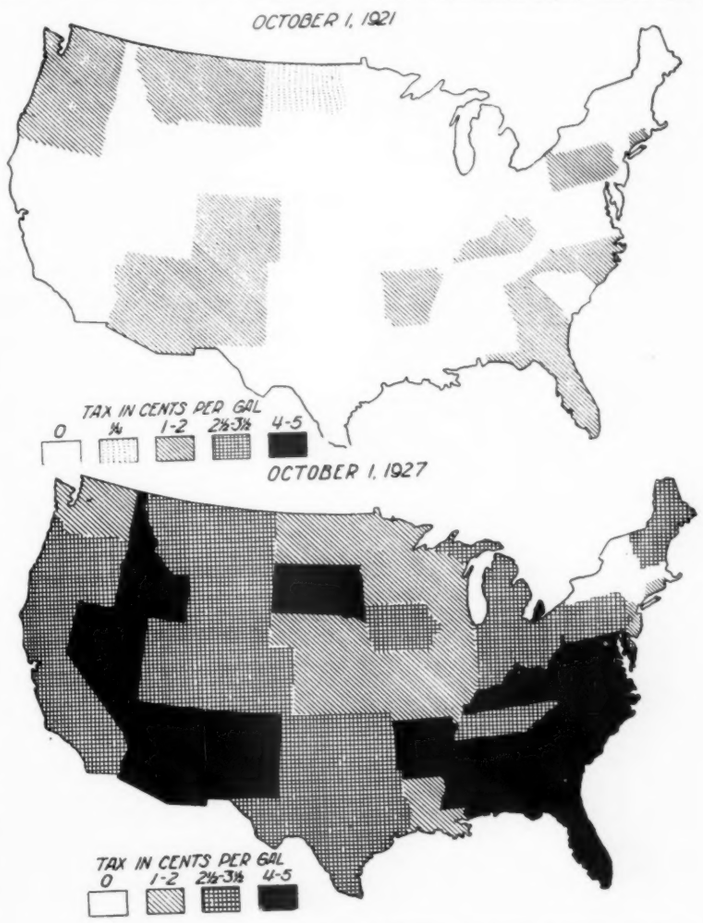
The 1925 revenue from the gasoline tax was approximately twice that of 1924. This was increased by $40,000,000 in 1926.

By 1927 with the tax already in effect in all but four of the states the increased revenue was brought about largely through increases in the tax rate in states where a tax had been effective for some time. Of the four states which did not have a tax at the beginning of 1927 only two remain. A 2-cent tax became effective in Illinois on August 1 and the 2-cent tax in New Jersey has been in effect since July 1. New York and Massachusetts are the two states without a tax at present. Efforts are being made to enact laws providing for 2-cent taxes in both of these states. It is predicted that the gasoline tax will be effective in all states before the end of 1928.

Tax Distribution

At present 13 states have a 2-cent tax, 18 a 3-cent tax, 2 a 2½-cent tax, 8 a 4-cent tax, 1 a 4½-cent tax and 5 a 5-cent tax. These data include the District of Columbia which has a 2-cent tax.

The accompanying table summarizes the gasoline tax situation for the first six months of 1927 based on data collected by the Bureau of Public Roads of the United States Department of Agri-



—Courtesy of Western Petroleum Refiners Association.

Map showing spread of state gasoline taxes.

Gasoline taxes by states.

culture. This shows the tax for the first six months totaled $101,250,841.

The tax, however, for the last half of the year will be almost 50 per cent greater. Gasoline consumption due to more favorable weather conditions and an increased number of motor vehicles in use will be approximately 10 per cent greater the last half of the year.

In addition it will be noted in the table that important increases in tax rate will become effective the first half of the year the full effect of which will be reflected in the data for the last half of the year. Since July 1, additional advances have become effective which have important bearing on the total tax collected the last half of the year. This includes the new 2-cent taxes in Illinois and New Jersey, two of the largest gasoline consuming states.

Increases in Tax

The first half of the year the following increases became effective:

	Old Tax	New Tax
Alabama	2	4
Arkansas	4	5
Colorado	2	3
Delaware	2	3
Idaho	3	4
Maryland	2	4
New Hampshire	2	3
New Mexico	3	5
Ohio	2	3
Rhode Island	1	2
Texas	1	3
Vermont	2	3
Wyoming	2½	3

Since July 1 the following additional increases have become effective:

Florida	4	5
South Dakota	3	4
West Virginia	2	3
California	2	3
Pennsylvania	2	3

These increases in 18 states which became effective the first nine months of 1927 reflect the trend toward higher gasoline taxes. Consumers of gasoline usually do not appreciate the full significance of this tax, overlooking the fact that it accounts for from 10 to as high as 33½ per cent of the price charged them at the filling stations.

SCIENCE EMPLOYED IN SEARCH FOR OIL

(Continued from Page 172)

measured short intervals of time, the time elapsing from the discharge of the dynamite until the sound wave resulting from it reaches the seismograph can be measused from the record made on the smoked glass and photographic film by the tuning fork and stylus.

Tuning Fork Utilized

In other words, the ordinary movement of the tuning fork is registered on the film from the time the dynamite is discharged until the sound resulting from the discharge reaches the seismograph. When that sound reaches the instrument, the tuning fork vibrates more rapidly and this fact is recorded on the film. By measuring this elapsed time, it can be calculated whether the sound wave traveled through hard rock or soft formations.

If the sound wave reached the seismograph more quickly than had been figured it would, were the earth's formation between the instrument and the place where the dynamite was discharged of soft material, then it is known there must be hard rocks projecting towards the surface of the earth at some point between the seismograph and point where the dynamite was discharged. The sound wave then would have gone into the ground and to this hard rock formation and traveled through the hard rock formation more quickly than it would have had such a formation not been present and there been nothing in the path of the wave but shale, clay or gumbo.

The accompanying sketch illustrates this.

Through the use of these instruments the petroleum industry is making a scientific search for hidden domes and structures where oil possibly has accumulated. This search is being carried on throughout all areas which give any promise of being oil bearing. The industry is spending hundreds of thousands of dollars in this effort to locate future oil fields in order to assure this country petroleum reserves to care for future requirements.

MANY WELLS START WITH SMALL OUTPUT

(Continued from Page 184)

members of the association would have a comprehensive view of the general production situation at all times. When the survey of The Oil and Gas Journal's report was completed and published by the association it surprised even hard-boiled oil men. The percentage of small wells was a distinct shock. The paucity of very big wells was well known to them, but it is safe to say that few of them had any idea that the wells below 500 bbls. a day in initial production represented 921 out of every 1,000 oil wells completed. The report emphasized the tremendous importance of a few very large oil wells on an industry that could get along better if it had fewer of these 5,000 and 10,000-bbl. wells. The importance of a Seminole Field or a Yates Pool was brought out strongly. It is well known in the oil industry that had the Seminole Field not been discovered the industry would have been drawing heavily on its crude oil stocks for a good part of this year at least. Seminole's big gushers produced enough to create a surplus of oil and to bring about a demoralized condition in the business and the whole field was owned by a handful of oil companies. The next big field, that in Pecos County, Texas, is owned for the most part by an even smaller group of operators than in Seminole. Thus in the course of a year where say 7,778 wells are dry and 8,131 wells just pay their way 305 wells can wipe out the profits of a year for all the companies and individuals engaged in fields of small oil production. In 1926, for example, out of 27,791 wells completed east of California, 66.6 per cent were either dry holes, small wells or gas wells, and 2.2 per cent started off higher than 1,000 bbls. But it does not take many of these 1,000 to 10,000-bbl. wells to cause a lot of grief to the big majority of oil companies and oil men not so fortunate as to be "sitting in the game" in the big flush fields. It is for the protection of these operators who represent about 80 per cent of the wells in the United States that the oil industry wishes to be permitted to stabilize production so that the mass of oil men may make a living profit from their operations.

The accompanying table gives results in detail for each of the seven years. The percentage figures given are based on the total number of completed wells, including dry and gas, while the percentages given in the opening of this story are based on the oil wells alone. Thus the small wells represent 48.8 per cent of all the oil wells completed, but represent 31.7 per cent of all the completed wells including the dry and gas wells.

INDUSTRY APPRECIATED

In the crucial days of the World War, the American oil industry unselfishly responded to a nation's needs. The Government was appreciative then, and the Government is appreciative today of the fine spirit of co-operation in this comprehensive national survey which the Federal Oil Board has under way, and which may mean so much to posterity. The story told by the industry to this board, in its own language, in its own way, of its own problems, is enlightening and helpful.—Chairman Work, Federal Oil Conservation Board.

GASOLINE TAXES FOR FIRST HALF YEAR, 1927

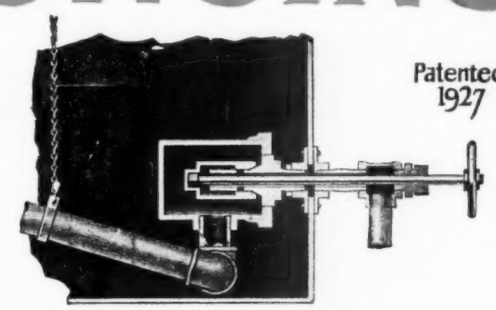
Total Taxes Earned on Motor Vehicle Fuel, Refunds on Gross Tax, Disposition of Fund, Rates and Gallons of Gasoline Consumed by Motor Vehicles Used

States and District of Columbia—	Gross tax assessed prior to deduction of refunds	Exemption refunds: (deducted from gross tax)	Total tax earnings on fuel for motor vehicles[2]	Disposition of total gasoline tax earnings[1]: Collection costs (half year)	Construction and maintenance on rural roads: State highways	Local roads	State and county road bond payments	For miscellaneous purposes	Tax rates, 6 mos.: 1927 Cents per gallon Jan. 1	June 30	Date of rate change	Net gallons of gasoline taxed and used by motor vehicles
Alabama	$2,653,637	.....	$2,653,637	$10,302	$1,300,778	$1,342,557	.....	.....	2	4	1/25	68,096,599
Arizona	662,729	$144,130	518,599	.....	259,300	259,299	.....	.....	3	3	....	17,286,641
Arkansas	1,741,086	180,527	1,560,559	46,817	358,929	171,661	[3]$983,152	.....	4	5	6/9	39,013,981
California	9,677,342	641,408	9,035,934	19,918	4,508,008	4,508,008	.....	.....	2	2	(4)	451,796,681
Colorado	1,237,359	43,282	1,194,077	(5)	730,359	463,718	.....	.....	2	3	5/1	57,701,371
Connecticut	1,307,024	.....	1,307,024	.....	1,307,024	.....	.....	.....	2	2	....	65,351,209
Delaware	273,203	6,112	267,091	.....	267,091	.....	.....	.....	2	3	3/24	10,329,754
Florida	5,355,319	.....	5,355,217	2,100	4,014,838	1,338,279	.....	.....	4	4	(6)	133,880,422
Georgia	3,071,528	.....	3,071,528	2,100	2,192,448	876,980	.....	.....	3½	3½	....	87,757,935
Idaho	637,373	30,679	606,694	5,203	601,491	.....	.....	.....	3	4	2/28	15,750,489
Illinois	.....	.....	.....	.....	.....	.....	.....	.....	0	0	[7](*)	.....
Indiana	4,697,106	132,395	4,564,711	7,398	3,038,209	1,519,104	.....	.....	3	3	....	152,157,038
Iowa	2,865,439	88,256	2,777,183	4,956	924,076	1,848,151	.....	.....	2	2	(8)	138,859,170
Kansas	2,217,334	326,089	1,891,245	(9)	1,640,500	250,745	.....	.....	2	2	....	94,562,249
Kentucky	2,472,015	.....	2,472,015	.....	2,472,015	.....	.....	.....	5	5	....	49,348,018
Louisiana	1,411,554	.....	1,411,554	(10)	1,411,554	.....	.....	.....	2	2	....	70,577,705
Maine	761,073	18,148	742,925	5,341	368,792	368,792	.....	.....	3	3	....	24,461,721
Maryland	1,831,699	57,257	1,774,442	1,250	[11]1,418,554	.....	.....	[12]$354,638	2	4	4/1	57,069,042
Massachusetts	.....	.....	.....	.....	.....	.....	.....	.....	0	0	(*)	.....
Michigan	5,414,065	380,267	5,033,798	14,718	2,994,725	1,024,355	[13]1,000,000	.....	2	2	(14)	251,689,874
Minnesota	2,367,545	93,218	2,274,327	(15)	2,274,327	.....	.....	.....	2	2	....	115,891,613
Mississippi	2,136,296	.....	2,136,296	1,800	1,003,006	1,068,244	.....	[16]63,246	4	4	....	51,826,257
Missouri	2,968,788	47,723	2,921,065	24,017	2,897,048	.....	.....	.....	2	2	....	146,053,264
Montana	443,439	15,076	428,363	3,150	425,213	.....	.....	.....	3	3	1/1	14,278,756
Nebraska	1,477,472	7,408	1,470,064	3,639	1,466,425	.....	.....	.....	2	2	....	73,503,208
Nevada	217,604	18,107	199,497	.....	99,749	99,748	.....	.....	4	4	....	4,987,419
New Hampshire	421,366	7,785	413,581	.....	413,581	.....	.....	.....	2	3	5/1	18,310,415
New Jersey	.....	.....	.....	.....	.....	.....	.....	.....	0	0	[17](*)	.....
New Mexico	[18]614,200	.....	[18]614,200	11,590	602,610	.....	.....	.....	3	5	3/7	14,081,758
New York	.....	.....	.....	.....	.....	.....	.....	.....	0	0	(*)	.....
North Carolina	4,108,931	176,387	3,932,544	8,218	1,705,745	.....	[19]2,218,581	.....	4	4	....	98,313,590
North Dakota	467,210	71,277	395,933	.....	395,933	.....	.....	.....	2	2	....	19,796,669
Ohio	7,722,220	182,394	7,539,826	.....	4,739,600	1,272,830	.....	[20]1,527,396	2	3	5/25	336,902,146
Oklahoma	3,208,634	12,258	3,196,376	.....	2,130,919	1,065,457	.....	.....	3	3	....	110,262,328
Oregon	1,690,893	77,684	1,613,209	4,149	1,609,060	.....	.....	.....	3	3	....	54,084,297
Pennsylvania	6,101,696	.....	6,101,696	(21)	4,067,797	2,033,899	.....	.....	2	2	(22)	305,084,825
Rhode Island	326,848	25,877	300,971	(23)	253,953	.....	47,018	.....	1	2	6/1	25,395,311
South Carolina	2,214,215	3,579	2,210,636	(24)	1,360,794	849,842	.....	.....	5	5	....	44,212,717
South Dakota	1,095,630	135,000	960,630	2,783	957,847	.....	.....	.....	3	3	(25)	32,616,933
Tennessee	1,983,139	.....	1,983,139	19,831	1,963,308	.....	.....	.....	3	3	....	66,104,639
Texas	5,975,553	.....	5,975,553	.....	4,481,665	.....	.....	[26]1,493,888	1	3	3/16	271,417,466
Utah	567,794	.....	567,794	5,375	[27]212,419	.....	[28]350,000	.....	3½	3½	....	16,222,709
Vermont	275,536	.....	275,536	.....	275,536	.....	.....	.....	2	3	6/1	12,130,292
Virginia	3,298,685	176,167	3,122,518	(29)	2,081,679	1,040,839	.....	.....	4½	4½	....	69,259,098
Washington	1,734,604	103,378	1,631,226	.....	1,631,226	.....	.....	.....	2	2	....	81,561,285
West Virginia	1,458,314	42,257	1,416,057	(30)	1,416,057	.....	(30)	.....	3½	3½	(31)	40,458,768
Wisconsin	2,618,397	92,339	2,526,058	(32)	1,085,000	1,441,058	.....	.....	2	2	....	126,302,901
Wyoming	257,275	367	256,908	[34]8	256,900	.....	.....	.....	2½	3	3/1	9,244,481
District of Columbia	551,405	2,800	548,605	.....	.....	.....	.....	[33]548,605	2	2	....	27,430,267
Totals	.....	.....	$101,250,841	$204,663	$69,616,088	$22,843,566	$4,598,751	$3,987,773	Aver. 2.55c		....	3,971,423,311

*No tax.
[1]Disposition data is estimated in some cases, and is approximately allocated according to motor fuel laws of the various states.
[2]This total tax shows the actual available amount for disposal, and excludes refunds.
[3]On state highway bonds, $78,028; remainder on district road bonds.
[4]New 3-cent tax effective July 29, 1927.
[5]Paid from oil inspection fund.
[6]New 5-cent tax effective July 1, 1927.
[7]New 2-cent tax effective August 1, 1927.
[8]New 3-cent tax effective July 4, 1927.
[9]Paid from state general fund, $4,500.
[10]Collection cost of $3,750 from legislative appropriation.
[11]Includes $125,742 for elimination of grade crossings.
[12]Assigned to Baltimore City; includes $31,435 for elimination of grade crossings.
[13]State highway bond retirements.
[14]New 3-cent tax effective September 4, 1927.
[15]Collection costs; $2,300 from inspection oil fund.
[16]For Seawall to protect highway; collected by an extra tax of 2 cents in Harrison County and 1 cent in Hancock County.
[17]New 2-cent tax effective July 1, 1927.
[18]Includes $4,402 for license fees for gasoline distributing stations.
[19]Approximated by prorating motor vehicle fees and gasoline taxes for interest on road bonds.
[20]For maintenance of streets in municipalities.
[21]Paid from general fund; approximately $40,000.
[22]New 3-cent tax effective July 1, 1927.
[23]Legislative appropriation $5,000 for the year.
[24]State appropriation of $5,000 for the year.
[25]New 4-cent tax effective July 1, 1927.
[26]For free school fund.
[27]Not available for road use until 1928.
[28]On state road bonds.
[29]Costs of $3,228 paid from appropriation from state revenues.
[30]Collection costs and interest of state road bonds chargeable to this fund but amounts not reported.
[31]New 4-cent tax effective July 1, 1927.
[32]Appropriation by State of $5,000 for half year.
[33]Assigned by law for use on Washington streets.
[34]Excludes $600 costs not charged to tax.

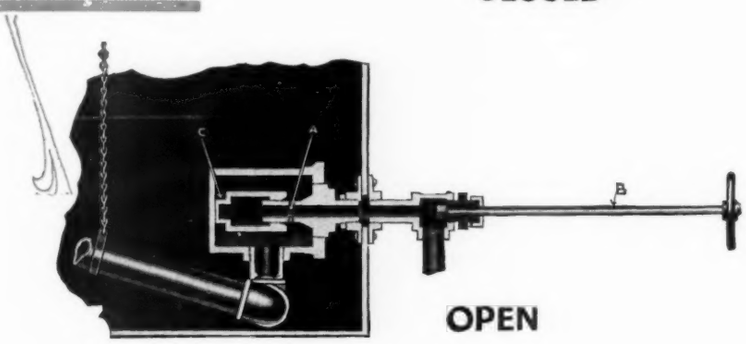
ANNOUNCING

The HUTCHINGS *non-freeze* TANK VALVE

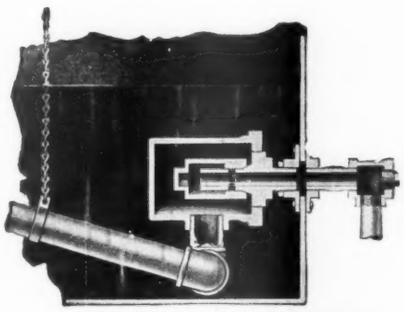


Patented 1927

CLOSED



OPEN



CLOSED-WRENCH REMOVED

The opening and closing mechanism on the HUTCHINGS Valve is *inside the tank.* When closed, therefore, there is no liquid in the exterior portion and no danger of freezing. No need of boxing, in cold weather.

Again, the exterior portion can be broken off by heaving or floods, without affecting the valve proper.

OPERATION: "A" indicates the port holes thru which liquid enters the flow line. The long "wrench," "B," engages the Valve Cap at "C," and the cap can thus be unscrewed to open position in Figure 2, which uncovers the ports. Wrench is then pulled out to Figure 2 position, in order to leave flow line entirely unobstructed. Figure 3 shows valve in closed position with wrench removed and a plug inserted. One wrench can be used for any number of valves.

Types for tanks, tank cars, refinery stills.

WESTCOTT VALVE COMPANY
East St. Louis, Mo.

WESTCOTT

OIL INDUSTRY MUST HAVE MORATORIUM

(Continued from Page 143)

able barriers. When all the producers on an oil structure can lawfully agree to equally restrict production, then the landowner can no longer hold the whip hand over the companies, since the production rate can be prorated fairly and lawfully in proportion to acreage.

The future balance and stability of production of the petroleum industry depends upon placing the landowner and the royalty holder within their proper sphere in the business of oil production. Their interests must be made amenable to the needs of the industry.

If the present economic stability of a basic industry, if the future well-being of the industries of the nation in time of peace, and the defense of the nation in time of war, depend upon the curtailment of production, then it is time the judiciary discontinue blindly following dead precedent and consider each oil and gas contract between producer and landowner according to the terms and intent of the contracting parties. It is time the courts decide the causes at bar upon the facts and conditions applying in the industry and according to the rights and principles involved. No two oil and gas leases in litigation present identical problems, either in fact or precedent; and each case deserves to be decided in view of the conditions presented.

If the oil and gas lease is redrawn to make it sufficiently elastic to allow proportional production among the operators drilling upon different parcels of land upon the same oil structure, and good faith is exercised in allotting the number of wells on each parcel of land to effect balance in the supply, prevent waste, and conserve the oil, the producers must be relieved of the judicial threat of forfeiture under the prevailing lease forms and judicial precedents.

Co-operation with Government

The present era of industrial prosperity has been brought about by the wise policy of the Government adhering to the principle of counsel and co-operation with industry. The feeling of mutual understanding will be shattered if management and capital are forced to defend property and personal rights from governmental control or supervision.

The history of the world is a story of the continual struggle of the people in their fight to attain freedom from governmental restrictions upon their personal liberties and property rights. Our Government was founded to guarantee to the people that personal liberty and private property rights should not be infringed by any governmental agency. To guarantee those rights a limited number of (enumerated) powers were granted to the Federal Government; the separate state governments were restricted in their spheres; and the powers not specifically granted to either the central Government or to the states were reserved to the people.

We marvel at the wisdom of our Federal Constitution, but we are continually confronted by radicals in public office who are each year demanding that private rights and properties be turned over to some government bureau.

Before the day of the "Big Stick," Congress passed the Sherman Law to club industry into maintaining competition between industrial units in the same or allied businesses. The oil business, more than any other industry, knows how well this law functions. The oil business has reason to fear the restrictions and limitations of the Sherman Law, and the reason for this fear is of recent date, as exemplified by the present overcompetition.

Oil Conservation Board

The President's appointment of a Federal Oil Conservation Board to act in an advisory capacity, and to co-operate with, and render assistance and service to the industry, met with the approval and acclamation of the leaders of the industry. But the industry does not favor any extension of the power of the board, if that extension is in the direction of operation, or control, or ownership. Conservative oil men know that it would be the utmost folly to give to any board or bureau the power to dictate, direct, or control the management of the oil business, or the private property of the individuals or companies comprising the industry.

It is the consensus of belief that Congress, by giving any board or bureau control over private property, would be committing our Government to an imperialistic design beyond the intent of the framers of the Constitution, and beyond the power granted Congress under the Constitution.

The petroleum industry has reached second place among America's industries within the short period of 75 years (the greater part of that growth within the past 25 years) because of, and by reason of the personal initiative and resourcefulness of the men in the industry. Had the rewards of success been removed, or had individual initiative been destroyed by government paternalism or bureaucracy, the supply of oil probably would not be sufficient to meet the nation's needs.

Other Industries Menaced

Every effort should be made to enlist the assistance and support of other units of American business to prevent the passage by Congress of any act abridging the use and enjoyment of private property. It should be understood that restrictive legislation placed upon the statute books by Congress limiting the oil industry, will certainly be construed to restrict other industries and limit other business. All legislation restricting, controlling, or limiting the free use of property in one industry sets a precedent for encroachment by Congress upon other industries. Furthermore, a law aimed at correcting a present assumed evil does not expire with the removal of the evil it is directed at, or change with the advance of industry, but lives long after as a blanket restriction upon all industry.

Every busines sman and every land or property owner, and every holder of an industrial bond or share of stock must realize that any encroachment by the Government through ownership, regulation, or control of property, or rights of management of the oil industry, is a step in favor of confiscation and control of all industry and property. Each time the inviolability of property rights and personal freedom is infringed, it becomes that much easier for radical minded law makers to obtain support in furtherance of their personal schemes and ambitions.

It is possible in a great emergency for public opinion to sufficiently influence the Supreme Court so that the court will uphold a congressional enactment abridging the right of the petroleum industry to manage and operate its own properties, forgetting the solemn injunction of America's freedom, and by implication changing the evident intent of the Constitution's guaranty of the inviolability of private property and personal initiative in the business and industries of the nation.

Reading the debates attendant upon the writing of the Constitution, and the later amendments forming the Bill of Rights, which restrict the power of Congress to abridge the rights and liberties of the people, it is plainly seen that every article was written into the Constitution with the particular end in view of preventing the recurrence of some abuse in history or within the experience of the framers of the Constitution; and it was the intent to limit congressional powers, so that Congress could not restrict the freedom of action of the people of the nation or limit them in the lawful use of their property.

Federal Control Unconstitutional

Eminent constitutional lawyers deny the right of Congress, by legislation, to control or interfere with private property in industry, except through regulation of commerce between the states or foreign nations. It should be emphasized that the restraints placed upon Congress were intentional. The framers of our Constitution were emerging from despotic control of person and property by George III and Parliament, and, understanding the dangers of unlimited power in government, they limited congressional and executive power, and placed safeguards within the written Constitution in prohibition of congressional and executive interference. Not being certain that Congress would at all times accept such limitation, the Supreme Court was placed in position to review, and check, and decide the constitutionality of Congressional enactments.

It matters not what term is used to designate interference with private property by Government. It may be called regulation, control, supervision, or ownership—to go beyond the rights granted by the Constitution to the state in interfering with property rights is despotism. The road from mild despotism to Bolshevism runs in a straight line.

Russia is as great in undeveloped natural resources, including petroleum, as the United States. Russia has unlimited cheap labor, an abundance of power, and untold quantities of raw materials. Russia is immediately associated with European and Asiatic markets; but Russia has for centuries been crushed by governmental restriction and interference with industry and individual initiative. The political and economic history of Russia bristles with interference and dominance over the persons and property rights of the people.

Russia's Contrast

The difference between American prosperity, evidenced by our industries, schools, social institutions and national life, and the prostration of Russia, rests upon the influence of our government and political institutions upon our initiative, personal freedom and property rights. The greatest danger to our freedom lies in the continuing efforts of radicals, and near radicals, to encroach upon these basic principles in the guise of regulation, control, operation, or ownership for the so-called benefit of society.

We are, and should remain, a nation based and founded upon the doctrine of democratic government. These principles have and will keep us a great and free people. We must be determined that these elemental rights of freedom are not transgressed. We are not ready to submerge our individualism, our initiative, our liberty of action, our right to own property (either corporate or individual), in any doctrine leading to socialism or to a government patterned upon Sovietism or Fascism.

The Time to Fight

The time to fight against restrictive legislation is prior to its passage. While it is true that the Supreme Court has the power to review congressional enactments and declare them invalid when warranted, yet, after Congress makes it a law, it usually stands the test of constitutionality. In 135 years the Supreme Court has only held 53 acts of Congress invalid. Mr. Justice Sutherland recently said in a Supreme Court decision: "This court, by an unbroken line of decisions from Chief Justice Marshall to the present day, has steadily adhered to the rule that every possible presumption is in favor of the validity of an act of Congress until overcome beyond rational doubt."

Considering the number of congressional enactments from the founding of our Government to the present time and the Supreme Court decisions declaring one invalid, it is evident that there is a very slight chance of having any enactment once written into the statutes declared invalid.

Congressional restriction of industry is the major reason for the present oversupply of petroleum. The restraint placed upon business by the Sherman law during a period when Congress believed that the combined initiative of industrial leaders would prevent the growth of small individual competing units is the cause of the present unfortunate condition in petroleum production. The Sherman law prevents the competing units of the industry from meeting for the purpose of stopping competition in drilling and producing. Because of such restraints, the industry has been unable to carry out the suggestions of the Oil Conservation Board. And even the Oil Conservation Board (at this time) cannot remove the restrictions of the Sherman law.

It is not good statesmanship for Congress to legislate with blanket effect upon the present and future of industry without putting some limitation upon the time and operation of general restrictive acts. Industry must go forward; it cannot wait upon legislation. The oil industry has been forced to accept the loss of $3,000,000,000 because of the Sherman law restrictions. The fear of the nation for its future oil supply is a direct result of the restraints of the Sherman law.

Overcompetition Required

The Sherman law requires competition in the oil industry. Doctor Work, chairman of the Oil Conservation Board, declares that "overcompetition is the cause of overproduction." He states that this "overcompetition has resulted in civil war" among the competing units of the petroleum industry. There is little reason to declare that civil war exists; but there is good reason for his declaration that overcompetition results in overproduction in oil. The condition he deplores is just what the Sherman Law requires under severe fine and criminal punishment.

After 125 years of fighting over tariff rates, Congress learned that the tariff laws needed flexibility in order to meet the rapidly changing industrial conditions. Finally a Federal Tariff Board was given power to change rates with the approval of the President. The President is now able, upon the advice of the tariff board, to change rates or hold in abeyance duties where it is for the benefit of the industries of the nation.

Remove Restrictions

The President should be given authority, upon the recommendation and request of the Oil Conservation Board, to suspend the mandate of the Sherman law requiring competition in oil production, so as to permit agreements in curtailment of drilling and production when the national supply exceeds the demand sufficiently to cause economic waste and unwarranted depletion of the petroleum reserves.

The petroleum industry is making every effort to restrict production in spite of the restraints placed upon it. The companies have invariably met overproduction with pinched-in and shut-in wells upon their fee-owned properties, and, where they could get the landowners to co-operate, they have paid advance rentals and advance royalties to obtain permission to restrict production upon leased land. Many companies have purchased outright the land in an effort to curtail the present oversupply.

The industry does not need more congressional restraint or control. It does need freedom to co-operate in restraining production. It needs freedom from law forcing overcompetition, and freedom from biased judicial decisions placing control of the rate of production on all leased lands within the power of the land and royalty owner. Congress can remedy the Sherman law evil. The industry can then co-operate to restrict production proratably between the land owners on each oil pool. Each land or royalty owner would then recieve his royalty based upon his acreage in proportion to its relation to the whole acreage on the oil structure resulting in conservation under private management co-operating with the Government.

Conservation and unlimited competition in oil production are diametrically opposed. There will be overcompetition and overproduction until nature's supply is prematurely exhausted unless there is relaxation of the Sherman law's mandate forcing unlimited competition applying to oil production. Conservation depends upon co-operation, co-operation depends upon Congress. An unsound economic condition can be remedied only by the removal of the cause.

MORE TO DRILLING THAN BORING A HOLE

(Continued from Page 200)

gas. It has two phases, economy, and safety. It permits the oil and gas to enter, and eliminates the possibility of any oil being blown away with the gas; and it also allows the gas to be col-

The Vanguard of Service

When in its relentless search for new fields the Oil Industry, ever expanding, stretched its border in Texas, west almost to the boundary of New Mexico, Continental foresaw as at Seminole the industry's needs and established the first supply store at the far western point of Pyote, Texas.

The wisdom of this step has since been proven by the splendid volume of business enjoyed since locating there. Pyote is ideally located to serve Ector, Andrews, and Winkler Counties as well as new territory in New Mexico.

Continental has also opened a store recently at Muenster, Texas, in Cooke County, 30 miles East of Nocona. This is the nearest store to any of the Cooke County operations.

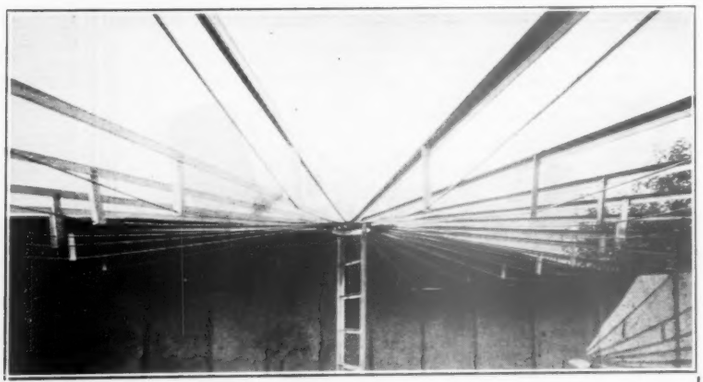
Just two more proofs that CONTINENTAL is always on the alert, ready to pioneer in rendering service.

"If CONTINENTAL Sells It, There Is No Better"

THE CONTINENTAL SUPPLY COMPANY
General Offices: St. Louis
Export Office: 74 Trinity Court, New York City
London Office: 316-317 Dashwood House, Old Broad St., E. C. 2
THE CONTINENTAL SUPPLY COMPANY, Limited
69 Thomas Block, Calgary, Alberta, Canada

CONTINENTAL

KEYSTONE COPPER STEEL



Maloney 5,000-Bbl. Tank during construction—Showing cantilever construction of deck supports and double rows of bolt holes at seams. A. P. I. Specifications.

NOW—5,000-Bbl. AND 10,000-Bbl. MALONEYS

MALONEY Bolted Steel Tanks can now be had in any capacity from 12 barrels to 10,000 barrels. The larger sizes, recently added to the MALONEY line, make available for long-time, volume storage the economies of the original bolted steel tank.

All sizes above 1,500 barrels are made with heavy cantilever construction deck supports. Side seams are reinforced with rigid steel double-channels. Bolts are ½-inch, and are our new specially oil heat treated bolts of 90,000 pounds tensile strength.

MALONEYS are made of rust-resisting Keystone Copper Steel, and painted with Maloney Special Pearl Gray Paint. The patented Maloney "crimp" causes parts to fit with accuracy. Use of our special rubber packing, and our Gaso cement, renders all seams oil, water and gas tight. Large cleaning out plates are set flush with bottoms. Valve and deck equipment is the best the market affords.

"Alone in Quality"

MALONEY TANK MFG. COMPANY
Tulsa, Okla., U. S. A.
Distributors at All Principal Petroleum Points

Sizes: 12 to 10,000 Barrels.

Packed in Steel-Bound Crates for Export

Howell Aluminum "3-in-1" Vacuum Pressure Valve and Thief-Hatch—The BEST and LATEST Deck Equipment—POSITIVE Safety.

MADE OF KEYSTONE COPPER STEEL

MALONEY PATENTED BOLTED COPPER-STEEL TANKS

MADE OF KEYSTONE COPPER STEEL

MALONEY
ALONE

lected and placed into gas lines from which it may be sold. The safety factor is that it keeps the gas from blowing wildly into the air, which has resulted in innumerable accidents.

Vapor-tight tanks are mostly used in the oil fields, in order to eliminate many losses in the gravity of the oil through normal action of the air. A suitable number and arrangement of valves must be placed on the well, and on the tanks to provide for shutting off the flow at any desired point in case of fire or other accident.

Saving the Oil

All these steps are taken to save all possible oil, and also to prevent the spectacle which was formerly observed in the field of oil being blown all over the landscape. The industry has made much progress in saving oil while wells are being drilled in; but its progress has caused extra expense in equipment.

The storage tanks on the lease are measured by the pipe line company which will take the oil, and copies of their contents sent to the producers. The measurements are calculated for fluid contents every quarter of an inch all the height of the tank.

The oil now goes (assuming that oil is found) into the hands of the pipe line company. The pipe line gauger turns the oil from the stock tank into the gathering system of the purchasing company and it is pulled by a suction pump from the tank to the auxiliary field station. From the field station other pumps propel it through the lines to the nearest main line station where mammoth pumps, operated mostly by Diesel engines, continue its flow to the desired point, either a tank farm, or a refinery.

Seasonal Changes In Oil Pipe Trade; New Line Surveyed

By B. E. V. Luty

PITTSBURGH, Pa., Nov. 28.—The pipe trade has been undergoing its usual seasonal changes, the only special incidents lately being the placing of line pipe orders recently reported, the Amarillo-Denver gas line and the Roxana supplementary oil line. The United Producers Pipe Line Co., a subsidiary of the Transcontinental Oil Co., has completed a survey for an oil line to run about 400 miles from western Texas to the Houston ship canal, but there is no information that any inquiry has been put out for the line pipe involved.

Demand for oil country goods generally dropped to small proportions a couple of months ago and is now running along in a mild way.

Demand for standard or merchant pipe has been slipping a trifle of late and is now at the close of its active season. As jobbers have been carrying very limited stocks, a fair demand is expected to continue, as there is no occasion for liquidation in anticipation of January 1 inventories.

Prices Stabilized

Prices at mills are regarded as well stabilized again, with the increased trimmings recently accorded. There is no thought of new discount cards on standard pipe or price lists on oil country goods being issued. It is remarked in the trade that the mills that cut prices and brought about the recent increases in discounts found that there was no permanent benefit to be secured by the course, simply a lower market all around, and that accordingly they may be expected in future to adhere to regular terms.

Pipe mills are operating at about 50 per cent of full capacity, and that is a fairly good rate considering all conditions, the unfavorable season of the year, the large productive capacity, and conditions in other branches of the finished steel trade.

In steel as a whole the outlook is better than two or three weeks ago as to both tonnage and prices. There are no signs of any material decrease in mill operations as frequently occurs in the closing weeks of a year, while all precedents promise increasing mill operations immediately after the turn of the year and lasting through March. Almost invariably there has been decidedly heavier production of steel in the first half of a year than in the second half, by 10 to 15 per cent on an average. Steel production is now at about the same rate as prevailed steadily in the four months, July to October, inclusive, at about 68 per cent of full productive capacity. Steel finishing departments average lower percentages than this, as there is always more steel finishing than steel making capacity.

Favorable Item

As to steel prices, there is the favorable item that the advance of a dollar a ton in bars, shapes and plates is established, at least for the time being, at 1.80 cents Pittsburgh and 1.90 cents Chicago. These prices are still below those of early in the year, and there is steel due buyers at below the current market, so that not a great deal has been gained and the mills are hopeful of being able to make another advance, perhaps in December after covering the larger buyers for first quarter at present prices.

In sheets the market is a shade easier again, as galvanized sheets frequently go at 3.60 cents, making the range 3.60 cents to 3.75 cents against 3.65 cents to 3.75 cents a week ago. Black sheets remain at 2.80 cents to 2.90 cents, while automobile sheets are firm at 4.15 cents.

Standard Sanitary Manufacturing Co. is engaged in buying its pig iron supplies for the first half of the new year, but details of purchases of valley iron are not yet available. The buying may set a pace for other activity, the valley market having been stagnant for a long time.

Connellsville coke remains as dull as ever and prices are easier on heating and furnace coke. The coal market generally is in very poor shape. Open shop operators, paying below the Jacksonville scale, have much trouble in selling their coal and little if any trouble in securing miners.

LEASE TERMS CAUSE OF OVERPRODUCTION

(Continued from Page 160)

Burbank Field, which was developed mainly during the great overproduction period of 1923 was leased under these requirements.

Government Hastens Drilling

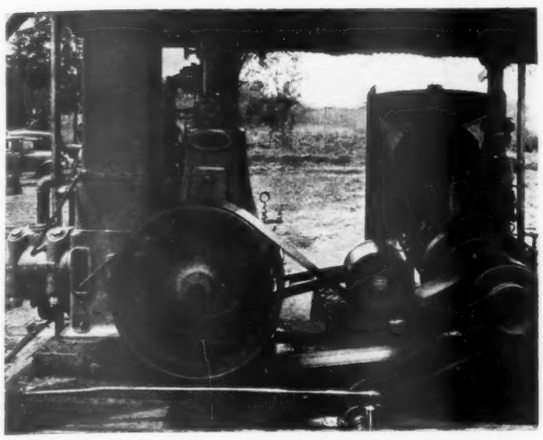
In granting permits for oil and gas prospecting, or "wildcatting," on government-owned lands the permittee is given the right for two years to prospect for oil or gas upon the express condition that he mark each of the corners of the claim within 90 days with substantial monuments; that within six months he install a substantial and adequate drilling outfit; that within one year he drill one or more wells to a depth of at least 500 feet and that within two years he drill one or more wells to a depth of at least 2,000 feet unless oil or gas shall be sooner discovered.

In ordinary commercial leases the lessee is given from 5 to 10 years in which to start a well, unless oil or gas wells on an adjoining tract or tracts require offset wells. The lessee is given plenty of time to wait for a demand for crude oil sufficient to warrant drilling his exploration well or wells.

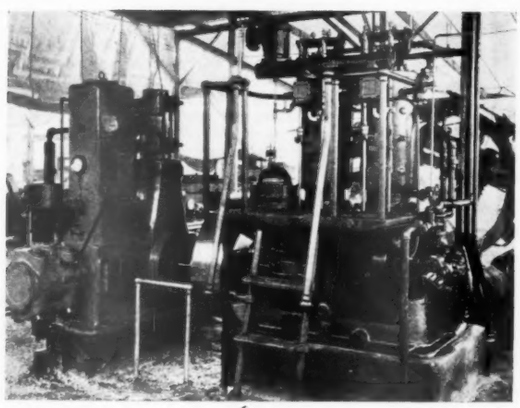
A Silent Protest

A silent protest on the part of the oil industry against the Government's hurry in its drilling requirements has been made in recent times in the Osage Nation. It has not been easy to sell wildcat leases even at the minimum price and at every recent sale tract after tract has been passed without a bid. At the next sale the buyers of leases will be given 5 years in which to drill instead of 12 months. This is done to encourage the purchase of leases and the Government's anxiety to dispose of tracts at this time when the country is producing about 300,000 bbls. a day in excess of requirements, with West Texas threatening to increase this excess production, does not indicate much of a desire to conserve our petroleum resources.

Watch for Sullivan Compressors

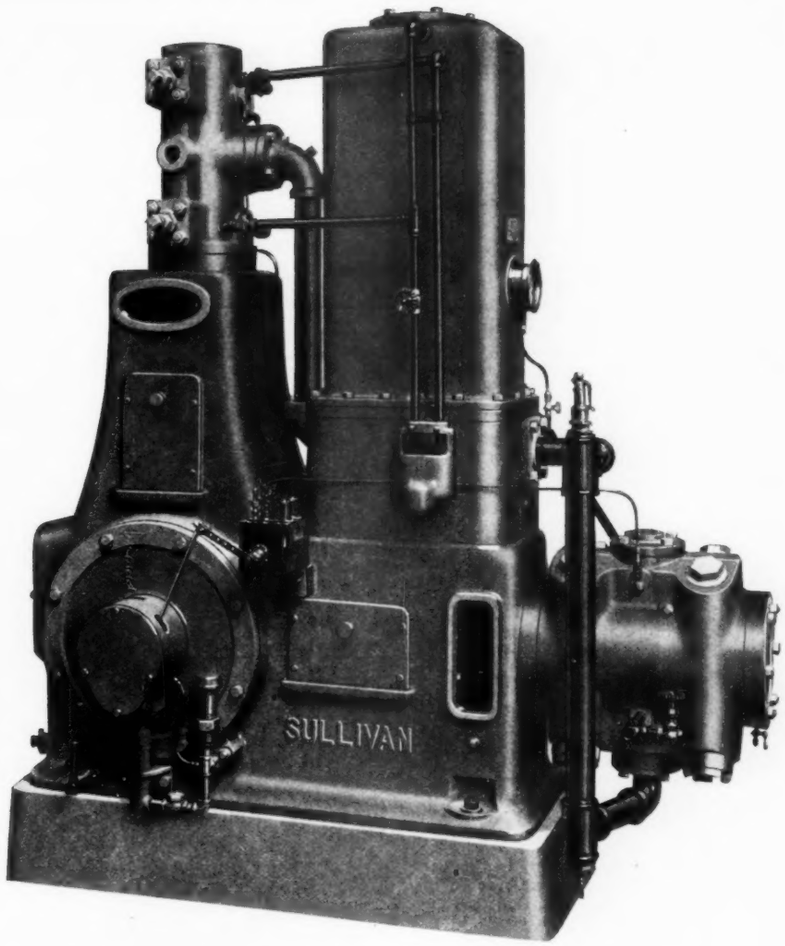


Sullivan Gas Lift Compressor in the Seminole Field. Drive is by belt from gasoline engine.



Sullivan High Pressure Gas Lift Compressor. Driven direct from Foos Engine.

Sullivan Gas Lift Compressor with Tex-Rope Drive from electric motor.



Sullivan Angle Compound Gas and Air Lift Compressors Are Making Good in Many Mid-Continent Localities

Oil men everywhere are being impressed with the adaptability of Sullivan Angle Compound Compressors to the varying and difficult requirements of gas and air lift service. At the International Petroleum Exposition at Tulsa, one of these machines ran in the rain and mud, maintaining a pressure of 500 lbs.—all day long, for a stretch of ten days.

During the past few weeks, machines have been purchased by many companies, and are making good for their owners.

The Sullivan Angle Compound Gas or Air Lift Compressor is a newly designed machine, embodying all the advantages of Sullivan Angle Compound Compressors, but adapted to the special requirements of oil field pumping.

It is available in a range of suitable capacities and pressures. It is built extra-rugged to stand the continuous service and overload conditions frequently encountered. It is compact and smooth-running and can be mounted on skids and quickly transferred to new locations. It is adapted to belt or Tex-Rope drive from electric motor, or gasoline engine, or to direct drive from synchronous motor, Foos Gas Engine, or Fairbanks-Morse Diesel Engine.

Small floor space, small and light foundations, low installation cost, adaptability to varying forms of drive, low power cost per unit of gas or air compressed, low cost of maintenance, reduction in care and attendance, and accessibility—are advantages of these compressors.

Write for the Catalog 83-G.

"If CONTINENTAL Sells It, There Is No Better"

THE CONTINENTAL SUPPLY COMPANY

General Offices: St. Louis

Export Office: 74 Trinity Court, New York

London Office: 316-317 Dashwood House, Old Broad St., E. C. 2.

THE CONTINENTAL SUPPLY COMPANY, Ltd.
69 Thomas Block, Calgary, Alberta, Canada

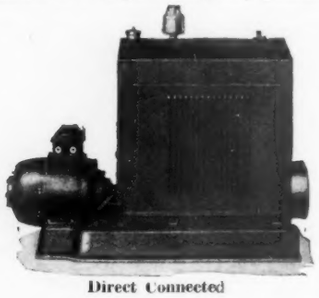
CONTINENTAL

EQUIPMENT AND SUPPLIES

LIGHTING PLANTS MADE FOR SERVICE IN FIELD

The Moon Manufacturing Co. of Chicago, manufacturer of the Moon steam turbine generators, used extensively as portable lighting plants in the oil fields, has developed a new line of portable gas-electric lighting plants, designed specially for oil country service. These outfits have been made in two types—the direct-connected and the belt driven.

The direct-connected lighting plants consist of a Moon generator, directed connected to a rugged, heavy-duty gasoline

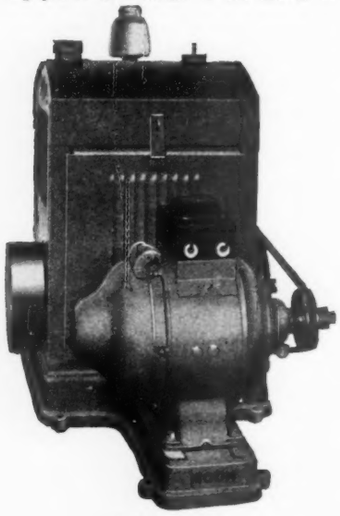


Direct Connected

engine, and all mounted on one substantial base and further equipped with heavy timber skids. An auxiliary pulley is included as standard equipment, and by means of it blowers, pumps, etc., can be operated by belt. This is also made possible by the generous surplus of engine power provided over that required for driving the generator.

By means of a specially designed clutch coupling, the generator can be disconnected from the engine when light is not required and then the entire capacity of the engine is available for other purposes. The equipments are full ball bearing, fully enclosed with rugged steel housing and made in capacities of 1½, 2¼, 3 and 4 kilowatt.

The Moon belt-driven gas-electric lighting plants are similar to the above, ex-



Belted Type

cept as the name implies, they are belt-driven instead of direct connected. A specially designed "V" type, weather-proof belt is used, similar in construction to a cord automobile tire, and the result is maximum transmission of power, together with long life. Capacities 1, 1½ and 2¼ kilowatt.

SOUTHWESTERN MOVES OFFICES

The Southwestern Engineering Corp. has moved the Mid-Continent factory from North Rockford Street, Tulsa, to Dawson Road and Harvard Street, adjoining the warehouse of the Pure Oil Co. The Southwestern has taken two large bays of the newly completed factory of the Vulcan Steel Tank Corp., where a complete welding and assembly shop will be maintained under the supervision of George Kelley. It also is warehousing some 50 pieces of equipment to meet rush deliveries to the gasoline and refinery industries. The mining and metallurgical department of the Southwestern will be moved to Tulsa from Joplin, Mo. To accommodate this consolidation of offices, new quarters have been taken at 600 Mayo Building, where R. B. Millard, Mid-Continent district manager, will handle all the territory between New Mexico on the west to Ohio on the east.

NEW LINE OF PORTABLE COMPRESSORS OFFERED

The Gardner-Denver Co. has added a line of portable air compressors in five sizes to its line of products. These portables have been produced after a survey

of present portable air compressor practice, and in them are said to be incorporated the better features of modern design.

The five sizes adopted are designed to meet all requirements within the scope of a portable. From these a selection can be made to operate the required number of concrete breakers, clay diggers, rock drills, hoists, pumps, or other equipment. The compressor speed has been kept within limits to make for dependable operation and long life. They are powered by heavy duty 4-cylinder Buda engines. Each size of engine is rated at a generous margin above the compressor requirements. A high-tension magneto with impulse starter means quick starting in cold weather. A speed governor holds the engine within the maximum r.p.m. limits.

FOMON GENERATOR TESTED

The American Fomon Co., Philadelphia, gives reports of two tests recently made with a continuous Fomon Generator using two dry chemicals which make it possible to use unadulterated foam-producing ingredients without fear of deterioration. The first report covers the period of the International Petroleum Exposition in Tulsa and the second a special test in Baltimore.

Attention is drawn to the fact that an effective range of foam stream, well over 100 feet, was attained when using 150 feet of standard 2½-inch hose on the discharge side of the generator.

CLEVELAND OFFICE MOVED

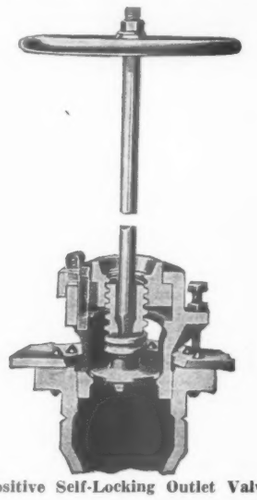
The Chicago Pneumatic Tool Co., 6 East Forty-fourth Street, New York, announces the removal of its Cleveland district sales office from 1241 East Forty-ninth Street, to 1727 Union Trust Building, Cleveland, Ohio.

SEPARATION PROCESS STARTS IMMEDIATELY

In the Ellis oil and gas separator, owing to the special arrangement of the baffles, the separation starts as soon as the production enters the separator. All cutting of oil, usually caused by churning and agitating, is eliminated and separation is affected by the oil course within the separator. The Ellis oil and gas separator, according to the manufacturers, does not permit the excess gas to enter the stock tanks with the oil, where it will waste in the air and carry with it the light qualities of the oil, and will not carry any fluid over the trap into the gas lines.

TANK CAR DEVICES ELIMINATE LOSSES

Three tank car improvements to prevent losses of gasoline and other volatile products by leakage through the bottom outlet, evaporation through the safety valve, and losses in the loading and unloading of Class 4 cars, have been developed by the American Car & Foundry Co.

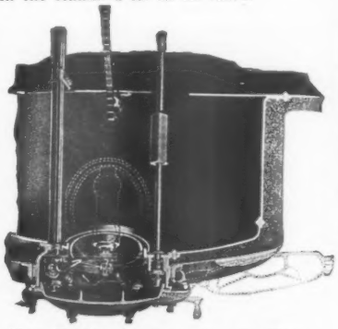


Positive Self-Locking Outlet Valve

One, a self-locking outlet valve, has been in use for some time. Its construction is such that the operation of a hand wheel not only opens and closes the valve, like an ordinary gate or globe valve, but also locks the valve positively in the closed position. This feature makes it impossible for anyone to tamper with the valve through the bottom outlet. It cannot be pried open and distortion of the tank due to breathing, or even breakage of the outlet chamber, will not unseat the valve when it is locked in position.

New Resilient Gasket Safety Valve

Another tank car feature recently developed is a gasketed safety valve. This valve retains all requirements of the standard A. R. A. device and adds a new resilient gasket, impervious to gasoline, which prevents leakage up to practically the popping point. Most of the valve parts are unchanged from the standard A. R. A. design, and the new parts can be applied readily to existing A. R. A. valves. The gasket is placed outside the standard metal-to-metal valve seat, and therefore can be replaced, if for any reason this should be necessary, while the tank is under pressure. In other words, removal of the gasket still leaves the same valve sealing mechanism that now exists in the standard A. R. A. valve.



New Double Dome Cover for Class 4 Tank Cars

The third recent tank car development is a double dome cover for Class 4 cars. This device permits loading and unloading without exposing the lading to the atmosphere, thus eliminating the dangers of an open tank and preventing large evaporation losses. The lading can also be gauged and sampled without being exposed to the atmosphere. The device includes two covers, both gas tight. The inner cover isolates all control fittings from the lading. The outer cover protects the fittings on the outside. Both covers can be swung open without difficulty, to permit access into the tank for inspection or cleaning. The tank can be unloaded through the top by air pressure, or through the bottom outlet, or by means of siphoning, without exposure to the atmosphere. It can be loaded through the siphoning pipe and the progress of loading observed through plate glass holes and a step rule gauge provided for the purpose.

FOSTER WHEELER CORP. HAS THREE BULLETINS

The first publications issued by the Foster Wheeler Corp., recently formed through consolidation of the Power Specialty Co. and the Wheeler Condenser & Engineering Co. are three bulletins.

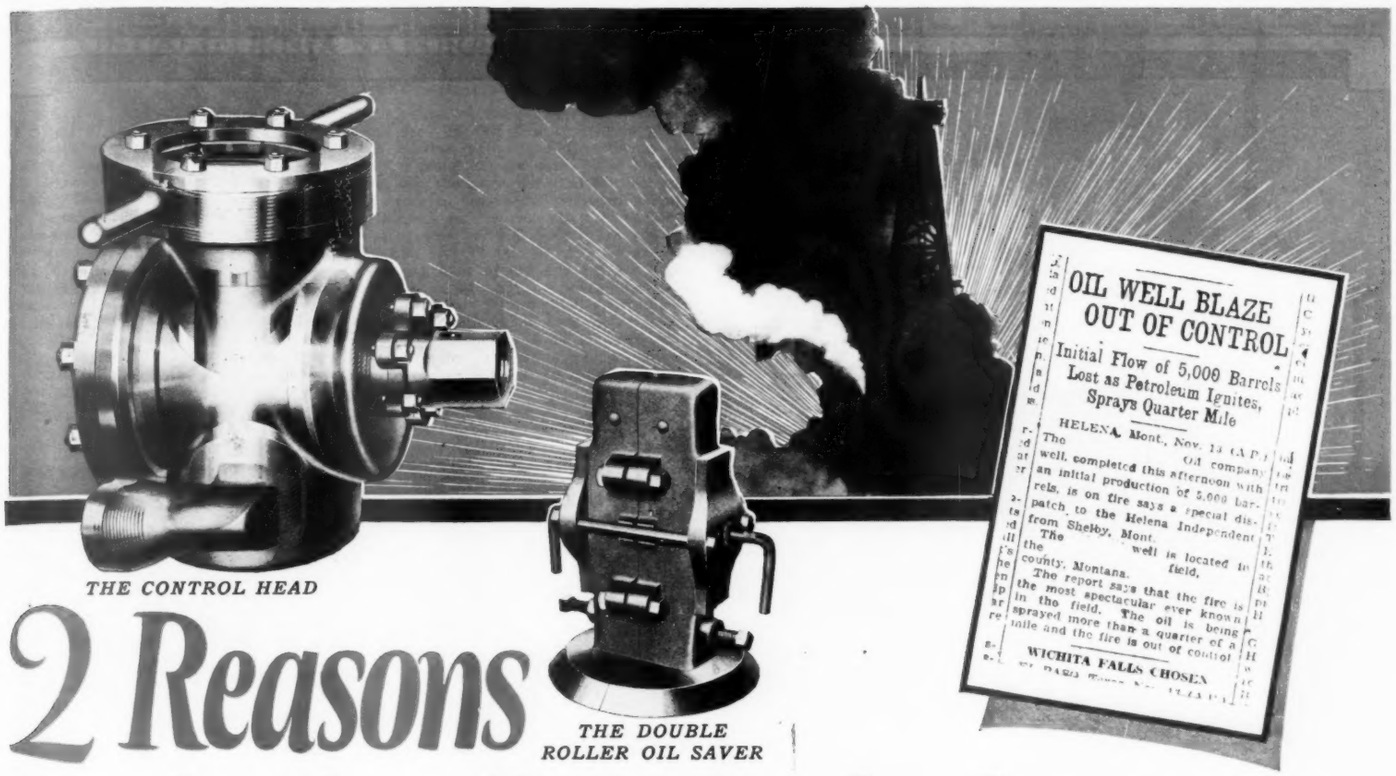
Bulletin 102 describes the Foster Economizer, widely used in power plants in the United States, Canada, Great Britain and Continental Europe. The bulletin contains interesting test data, photographs, drawings and a steam table up to 1,500 pounds gauge pressure and 300 degrees Fahrenheit superheat.

Bulletin 120 covers the new extraction type feed water heaters usually installed in turbo electric power stations. This bulletin includes heat balance diagrams.

Bulletin 119 deals with hot-water heating systems of the forced circulation type employing exhaust steam from the power plant as the source of heat. The bulletin contains photographs taken in nationally known plants.

TRANSPORTATION ENGINEER

The Selden Truck Corp., of Rochester, N. Y., has established a special equipment department to handle problems of motor transportation and special requirements to meet hauling conditions removed from the ordinary. Glenn W. Poyzer has been named "transportation engineer," in charge of this new department. When necessary he will analyze hauling problems and make recommendations.


OIL WELL BLAZE OUT OF CONTROL
Initial Flow of 5,000 Barrels Lost as Petroleum Ignites, Sprays Quarter Mile
HELENA, Mont., Nov. 13 (A.P.)
WICHITA FALLS CHOSEN

THE CONTROL HEAD

THE DOUBLE ROLLER OIL SAVER

2 Reasons why the oil waste of a few years ago is noticeably slight to day

A few short years ago "painting the derrick" was a common and costly occurrence when a well was drilled in. Today, thanks to modern methods, this practice has almost entirely disappeared. Almost, but not quite—read the newspaper item reproduced above. Some producers still take chances with wild wells, with the inevitable disastrous result, but the number who fail to equip their wells with THE CONTROL HEAD and the DOUBLE ROLLER OIL SAVER has become so small as to constitute "news" when one of their unprotected wells blows out.

THE CONTROL HEAD is made in all sizes, and for all rock pressures, affording absolute insurance against loss of oil when the well is drilled in, as well as complete protection against fire from stray gas. All necessary drilling operations can be performed without interference from the CONTROL HEAD. Any amount of flow of any pressure, is instantly controlled even though the tools or bailer may be in the hole. When it becomes necessary or advisable to shoot a flowing well, the CONTROL HEAD renders this operation perfectly safe.

THE OIL SAVER is made in two halves held together by means of two bolts on each side, passing through lugs on each half. There are two special sets of rubbers, one set in each of two chambers. The upper, or "wearing" set of rubbers is adjusted from the side with hand screws, thus assuring continuous efficiency of the packing contact with the wire line. When it becomes necessary, eventually, to renew the upper rubbers, the lower set is placed against the line, and a new set of upper rubbers is inserted without necessitating any interruption in drilling operations. When worn rubbers are replaced, the lower set is again loosened from the line. Maximum efficiency with minimum replacement cost.

OIL WELL IMPROVEMENTS COMPANY

Sole Manufacturers

Tulsa - - - - - - - - - Oklahoma

THE CONTROL HEAD and THE DOUBLE ROLLER OIL SAVER are

Standard Equipment on modern oil wells

OUR NEW WAREHOUSE

– and mechanical laboratory

Westcott & Greis, Inc., are pleased to announce the removal of our Tulsa warehouse stocks to our own modern warehouse buildings shown above, on Madison Avenue at the Frisco Tracks.

The rapid growth of our business during the past year has necessitated greatly enlarged warehouse facilities. We have, in the new quarters, space which will take care of expansion in our business for some time to come.

In connection with our new warehouse, we have established a well equipped and modern mechanical laboratory. Westcott & Greis engineers are specialists in problems having to do with the measurement, control and regulation of oil and gas, and our technical staff and laboratory are maintained exclusively for the service of our customers.

Our friends are cordially invited to visit our new warehouse.

WESTCOTT & GREIS, Inc.
Tulsa, Oklahoma.

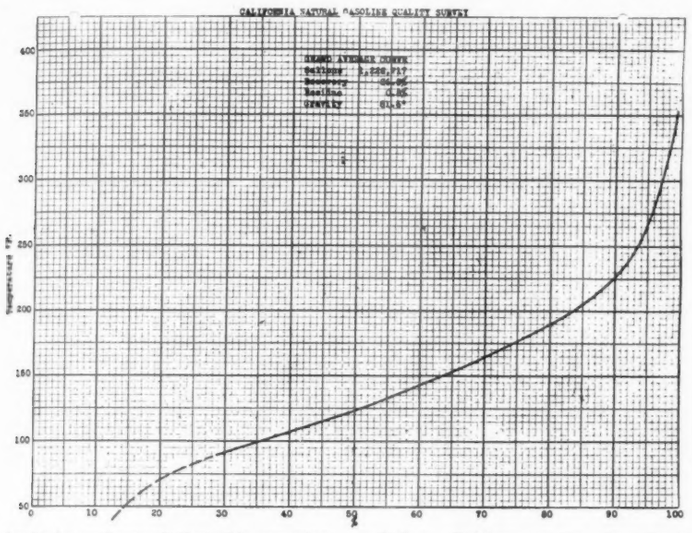
WESTCOTT & GREIS
MEASUREMENT AND CONTROL

REPORT ON QUALITY SURVEY OF CALIFORNIA NATURAL GASOLINE

By R. W. Garman*

Up to the present date there has been no survey of California natural gasolines as to quality. In fact it is only rather recently that the first surveys as to quantity were carried out. The California Natural Gasoline Association has naturally become quite curious as to just what various commodities are being handled in the State under the name of natural gasoline, and a committee was therefore appointed to study the situation. Now, by reason of the whole-hearted support of the natural gasoline manufacturers in submitting to the committee the results of Engler distillation of the product from separate plants, we are ready to submit a report which is really only of a preliminary nature.

This report is chiefly a comparison of Engler results. No attempt has been made to analyze various natural gasolines into the various hydrocarbons. In order to make intelligent comparisons it was necessary arbitrarily to classify into five groups according to distillation recovery, 90 per cent or more, 85 to 89.9 per cent, 80 to 84.9 per cent, 75 to 79.9 per cent and 74.9 per cent or less. It



should be understood that this grouping is not a classification proposal. It is used only for the purpose of present study. Before proceeding further it should be stated that, although the recognized method No. D 216-25T A. S. T. M. was specified for all natural gasoline manufacturers to use in making out their reports, there are undoubtedly many errors in those reports. For instance, samples were not secured at tank pressures in many cases, and such weathered gasoline will show better recovery than is really true. Otherwise, we believe the great majority of samples were taken in a proper manner, and that reports from a large number of plants will compensate a number of errors. It should now be mentioned that the reports cover a daily production of approximately 1,225,000 gallons daily, which represents about 90 per cent of the total State production.

Method of Procedure

Procedure in comparison of Engler results was: first, to plot Engler results for each of 104 gasoline plants; second, to group the results according to recovery, and then obtain weighted average curves for each group, showing also maximum and minimum curves of individual plants; third, obtain weighted average curve overall; and fourth, obtain recovery-gravity curve from group averages.

The first sheet shows the weighted average curve for group No. 1, recovery 90 per cent or over. It might be well to say a few words here as to our method of plotting curves. The reverse method was used on the data from each plant, the residue percentage first being deducted from 100 per cent. The distillation loss therefore shows at the left end. In order to obtain the weighted average readings, each curve after being once plotted was re-read directly on the 10, 20, 30, 40, 50, 60, 70, 80, 90 and 98 per cent lines of the curve sheet. The readings from the various individual plant curves were weighted according to gallonage. Weighted average recovery, residue and gravity were obtained in a similar manner, gravity A. P. I., of course, being changed to specific gravity in the meantime.

Referring again to this curve sheet, it will first be noted that the average falls much more closely to the minimum than to the maximum. In other words, the bulk of natural gasoline is nearer the lower line. It might be noted that the lower curve, which represents the output of an individual plant, might be said by some authorities to represent the best natural gasoline in California. The 10 per cent point of this lower curve as read from divisions on the sheet itself is 61; the 60 per cent point is 113; and the endpoint is 316; the recovery being 92.0 per cent; residue 0.8 per cent; and the gravity 87.9. Taking the upper curve, 10 per cent point is 135; the 60 per cent is 223; and the endpoint is 393; the recovery being 97.5 per cent; residue 0.7 per cent; and gravity 60.6. Readings from the average curve are 10 per cent, 74; 60 per cent, 143; and endpoint, 353; the recovery being 92.3 per cent; residue 1.0 per cent; and gravity 81.1. Group 1, recovery 90 per cent or more, represents about 25 per cent of the natural gasoline reported and includes the product from 25 of the 104 gasoline plants reported.

Even Distribution

The second sheet shows the weighted average curve for Group No. 2, recovery 85 to 89.9 per cent. In this case the average is only slightly closer to the lower curve than to the upper.

In other words the various gasolines in this group are rather evenly distributed between the two extremes. Reading on the lower curve, the 15 per cent point is 57, the 60 per cent point is 110, and the endpoint 345, the recovery being 86.0 per cent, residue 0.7 per cent, and the gravity 88.0. Taking the upper curve, the 15 per cent point is 96, the 60 per cent point is 195, and the endpoint, 365, the recovery being 89.0 per cent, residue 0.9 per cent, and gravity 69.0. The average curve reads: 15 per cent, 69; 60 per cent, 146; and endpoint, 325; the recovery being 86.7 per cent; residue 0.8 per cent; and gravity 80.9. Group 2, recovery 85 to 89.9 per cent,

*Before fall meeting of California Natural Gasoline Association at Los Angeles.

"TOLEDOS" ARE BUILT TO WEAR

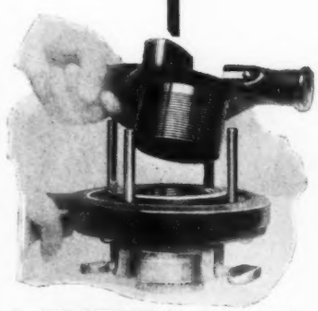
GENUINE "TOLEDOS"—have no equal among pipe threading or cutting tools. Today, as 25 years ago, they are regarded by experienced workmen as the really satisfactory tools to cut and thread pipe.

The same exacting care in the selection of materials, in the manufacture, and in the final inspection, to assure the purchaser the most that money can buy, is being exercised as it has been during all the years "TOLEDOS" have been built.

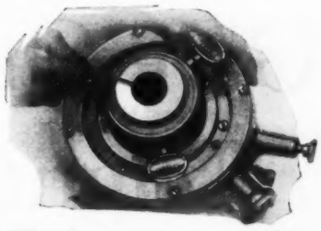
When you buy a genuine "TOLEDO" you are assured easy operation, smooth threads and perfect results with the least effort and in the shortest possible time.

"TOLEDOS" are strictly portable—may be operated anywhere and are made in various models to cut and thread pipe in all sizes up to 12". Hand operated, but if desired may be used with the "TOLEDO" Power Drive and converted into fast efficient power machines.

Send for our catalog showing the complete "TOLEDO" line.



A "TOLEDO" lead screw is smooth, clean cut, perfect.



Thumb screws are oversize. Loosen only one to remove bushings.

Dies are made of the finest tool steels, and perfectly tempered.

The name and trade-mark on the nameplate assures you the genuine.

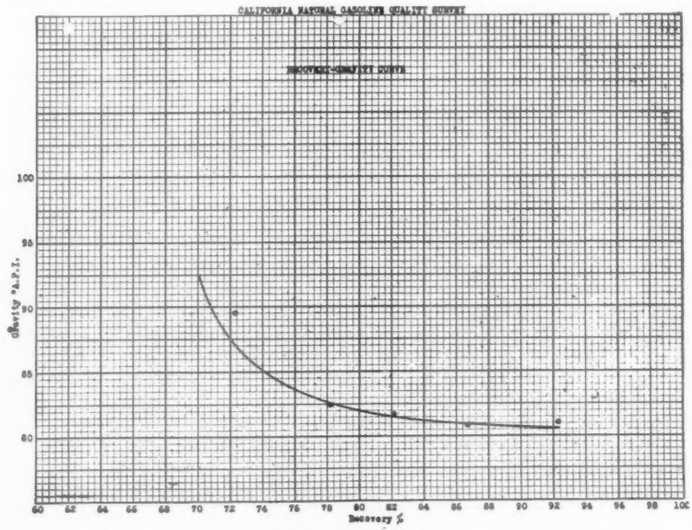
THE TOLEDO PIPE THREADING MACHINE CO. TOLEDO, OHIO

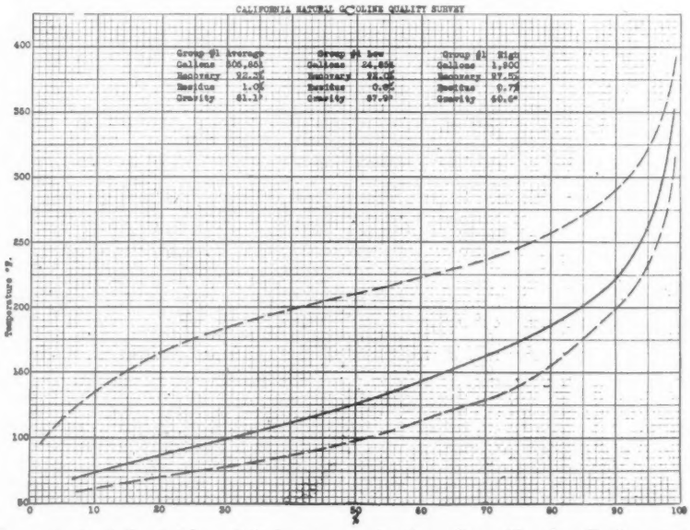
represents about 43 per cent of the natural gasoline reported and includes the product from 49 of the 104 gasoline plants.

The third sheet shows the weighted average curve for Group No. 3, recovery 80 to 84.9 per cent. It will be noted that the upper and lower curves indicate a rather narrow range. The average curve reads: 20 per cent, 69; 60 per cent, 147; and endpoint, 340; the recovery being 82.1 per cent; residue 0.8 per cent; and gravity, 81.7. This group represents 22 per cent of the natural gasoline reported and includes the product from 18 plants.

The fourth sheet shows the weighted average curve for Group No. 4, recovery 75 to 79.9 per cent. It reads: 25 per cent, 71; 60 per cent, 140; and endpoint, 353; the recovery being 78.1 per cent; residue 1.01 per cent; and gravity, 82.4. This group represents 5 per cent of the natural gasoline reported and includes the product from five plants.

The fifth sheet shows the weighted average curve for Group No. 5, recovery below 74.9 per cent. It reads: 30 per cent, 61; 60 per cent, 103; and endpoint, 296; the recovery being 72.3 per cent, residue 0.75 per cent; and gravity, 89.5. The gasoline here represented is 5 per cent of the total, and it is produced from 7 plants.





Recovery of Gravity

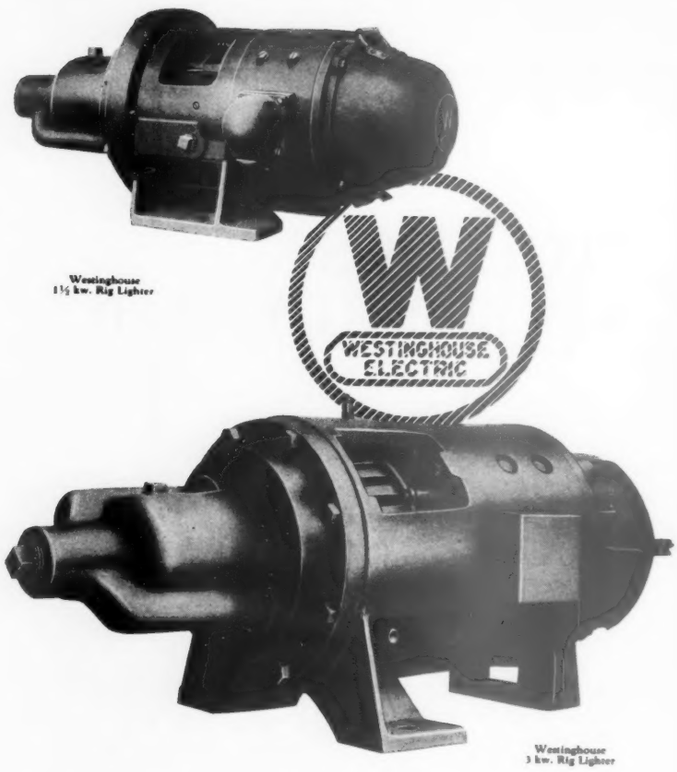
Before making a grand average of the five average curves, the next sheet shows the relation between the average recovery and average gravity of the five groups. It would be expected that gravity A. P. I. should decrease as the distillation recovery increases. In general such is the case, but the curve shows that a large portion of the high recovery gasoline has been carefully made and a comparatively high gravity maintained. However, this curve should not be taken too seriously, and is merely inserted as a general indication of the relation between recovery and gravity.

The seventh and final sheet shows a grand average curve of all California natural gasoline. This curve means that half the Engler readings on California natural gasoline fall below it and half above. The 30 per cent on this grand average curve reads 91, the 60 per cent, 143, and the endpoint 354, the recovery being 86.8 per cent; the residue 0.8 per cent; and the gravity, 81.6 degrees A. P. I.

Refinery Needs

A few comments might now be made. The ordinary conception of the natural gasoline user, usually the refiner, is that natural gasoline should be used as a blend with his refinery stock to raise the gravity, and he probably concedes that the higher the gravity the better the natural gasoline. Now this conception may be technically incorrect and the refiner may actually be purchasing volatility, but we arrive at the same answer. The lower Engler curves represent volatility and the natural gasoline with such curves is high gravity. We can therefore say that the refiner really wants a natural gasoline with a low Engler curve, provided always that he can handle such gasoline without loss.

Although the refiner actually wants such a natural gasoline, he is forced to make a very important reservation when he accepts such material. More often than not, such natural gasoline has so high a vapor pressure that large losses, both quantitative and qualitative, are incurred before the blend is effected. Moreover, in California it happens at times that some of the large companies



Westinghouse 1½ kw. Rig Lighter

Westinghouse 3 kw. Rig Lighter

Give One to the Night Gang

THEN watch production speed up. It will help to bring your well in quicker.

Easily installed—just bolt to the floor and connect to your steam line.

Obtain it from your nearest supply store.

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Westinghouse

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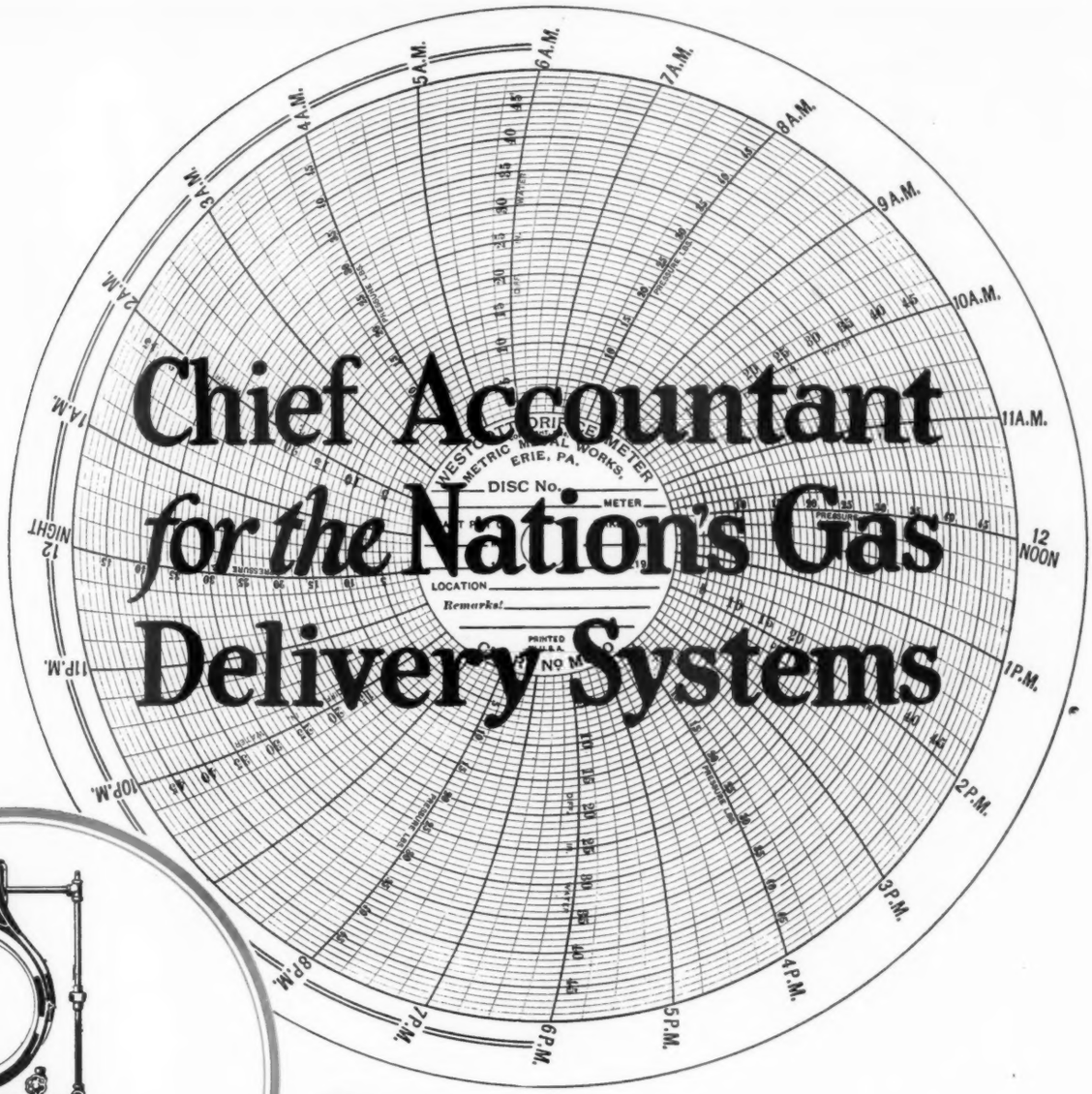
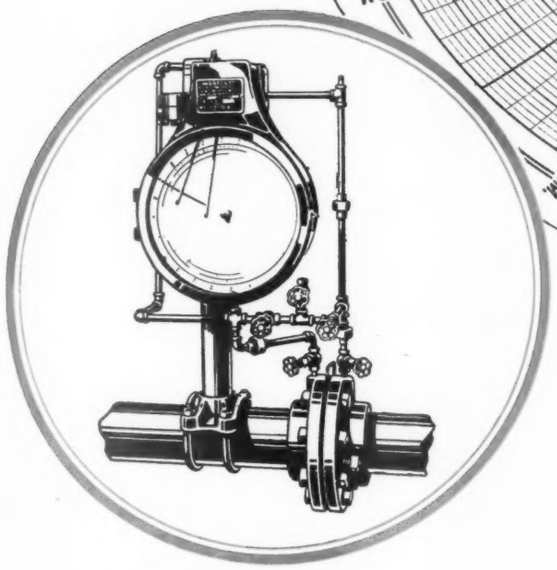
Rig Lighter



Chief Accountant for the Nation's Gas Delivery Systems



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An orifice meter points straight to the source of the gas industry's greatest bug-a-boo. Installed properly at the important checking points it will quickly allow proper analysis of why the "sent-out" gas goes astray, where and to exactly what extent. It's the "efficiency expert" and the "chief accountant" for thousands of gas distributing systems, to the great profit and satisfaction of the owners of the gas.

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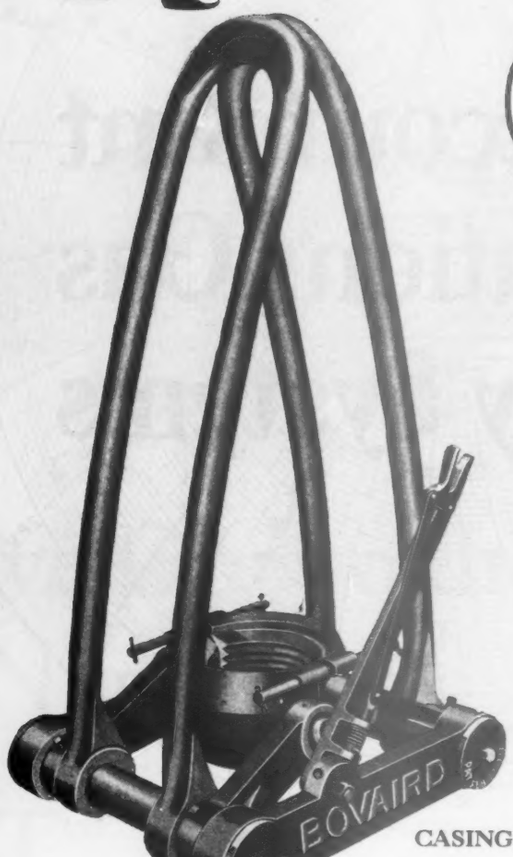
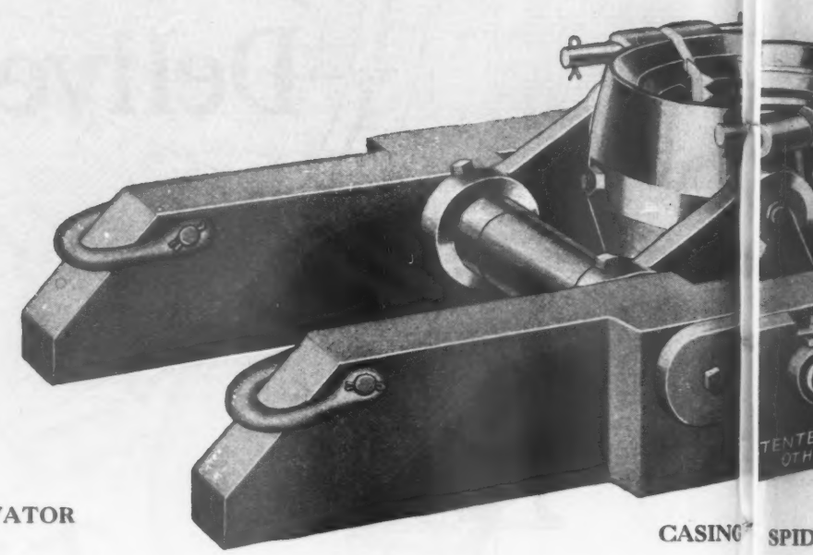


CASING ELEVATOR



CASING SPID

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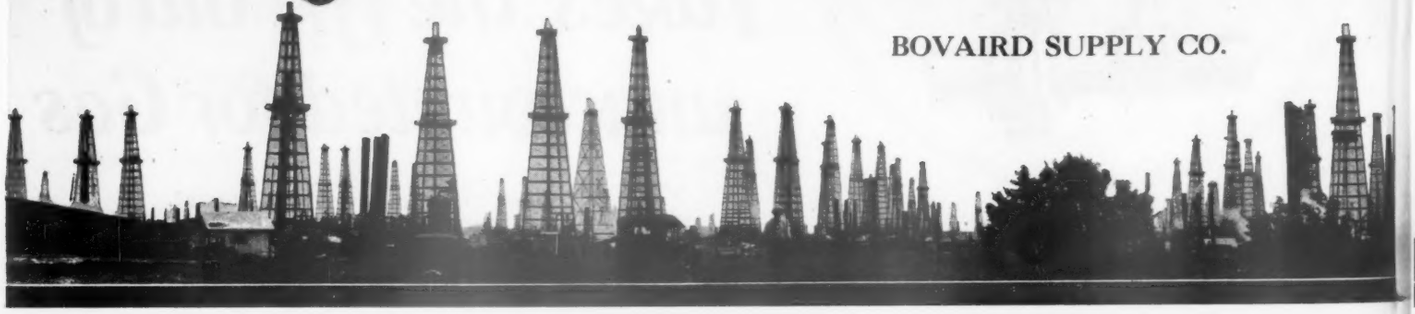

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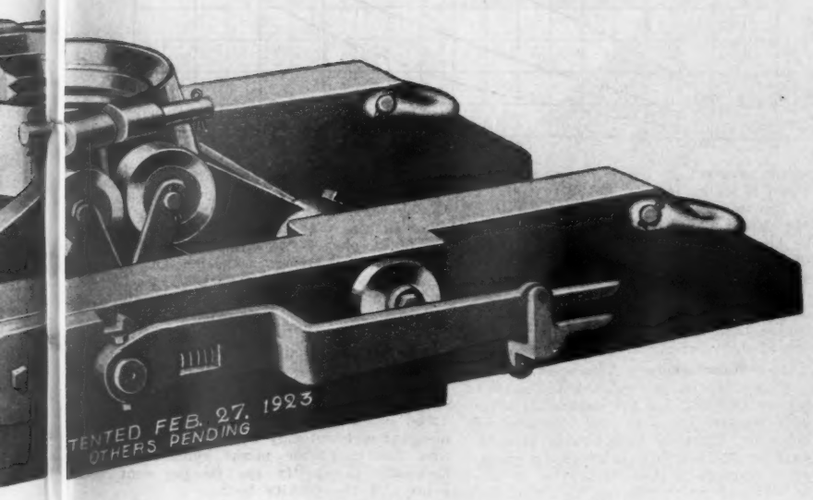

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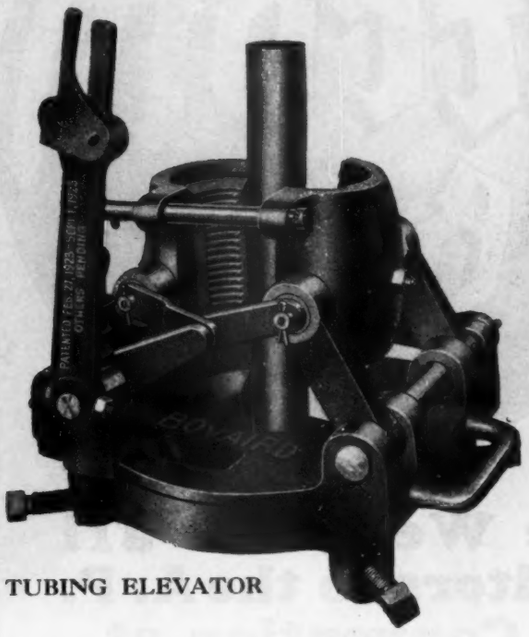

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who treat their gas themselves have an excess of natural gasoline, and, since there is no market for such excess, there is an involuntary weathering of some sort either before or after the blend.

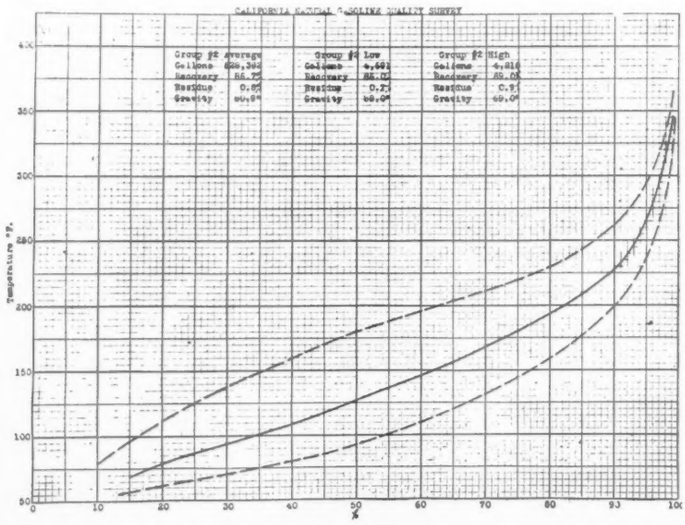
It seems obvious in such cases that the weathering should properly be done at the gasoline plants and should be controlled. On the other hand, there have been times when the refiner could not obtain sufficient natural gasoline. In such cases the refiner can use very low recovery natural gasoline if it is shipped by pipe line and can be properly handled under pressure at the refinery until the blend is made.

The substance of these remarks is that the refiner wants just as volatile material as he can handle without loss. As conditions change, the degree of permissible volatility should change. This can be done after a fashion by specifying the distillation recovery, but distillation recovery may not always be a reliable index of the volatility or vapor pressure.

Manufacturer's Viewpoint

Thus far the refiner's viewpoint has been considered, but the natural gasoline manufacturer has a decided viewpoint of his own, which is to make as great a quantity as possible, particularly when, as in California, there is usually no differential in price between high and low vapor pressure product. Ordinarily, the manufacturer suffers a large quantity loss when he is required to meet 90 per cent recovery. Proper fractionation of the product would seem to be the answer but in the past the cost of such fractionation, all things considered, has often been deemed greater than the loss without rectification or so-called stabilization.

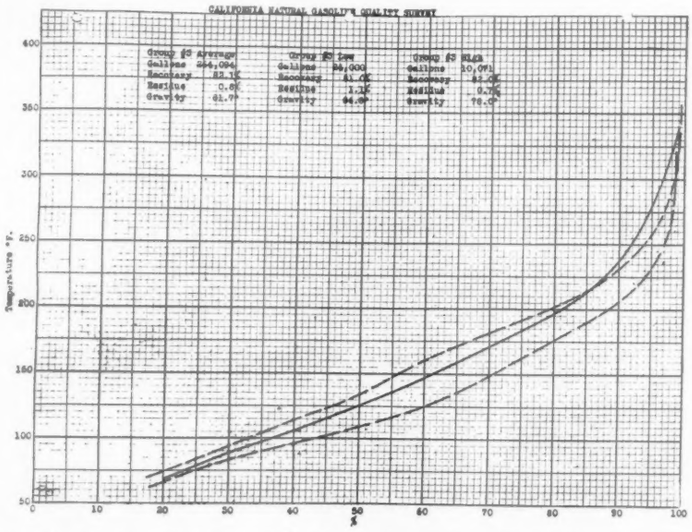
California conditions at present seem to be this: Refiners in general face an excess supply of natural gasoline; they therefore demand high distillation recovery in order to minimize losses. Natural gasoline manufacturers in turn must meet the arbitrary specification and suffer quantity loss. Finally, by reason of the arbitrary specification of high recovery by the refiner, there is likely to be an economic loss to the industry as a whole by reason of rejecting hydrocarbons which, under certain conditions, could be used as constituents of commercial gasoline.



There has been some agitation to include in specifications a limit on the Engler reading at 50 per cent. In most cases it was not stated how the curve should be plotted, something which has an important bearing on the matter. It is suggested that, where such specifications are considered necessary, reverse plotting and the 60 per cent point be used. Usually the refiner is protected by a lower limit on gravity, so that this 60 per cent reading scarcely need be specified. However, there may be some freak natural gasoline, such as that produced at re-treating plants where a blending material may be used, in which case the purchaser might consider it necessary to specify the 60 per cent point and the gravity both.

Pipe Line Delivery

Let us take the refiner's viewpoint



again. It is usually considered necessary for him to place on the market a commercial product which should have a true vapor pressure slightly below atmospheric pressure at the prevailing temperature at the delivery point. Let us say he knows the true vapor pressure of his straight refined product and the quantity thereof. Now if he is committed to ac-

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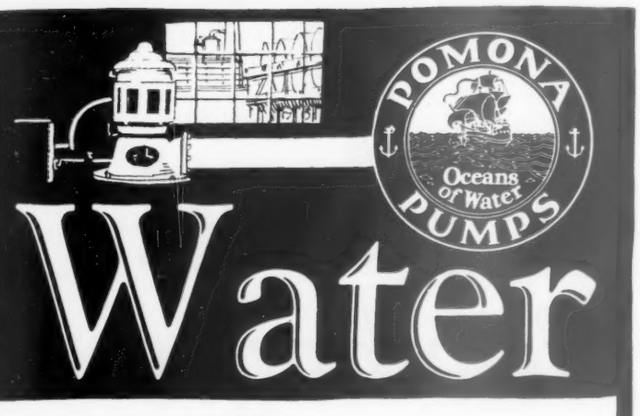

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Pumps

cept a certain quantity of natural gasoline, it should be comparatively easy for him to specify just what true vapor pressure this natural gasoline should have, such that he can use it without loss before or after blend, presuming he has pipe line delivery and receives it in pressure tanks. It should be mentioned that pipe line delivery in California is now the rule rather than the exception. In the event that other than pipe line delivery is used, the permissible vapor pressure is probably much more limited.

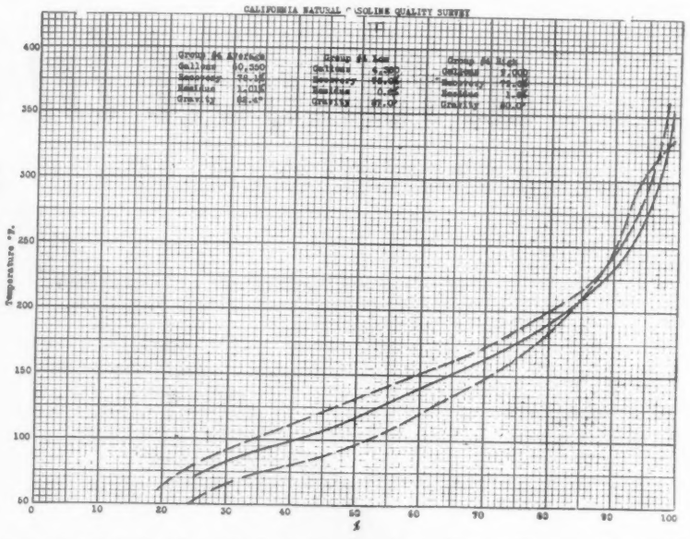
It might be argued that when the refiner specifies vapor pressure limits he may not reach the desired gravity with his blend, but he should specify the lower limit on natural gasoline gravity. This method of specifying vapor pressure of natural gasoline from day to day should result in a minimum loss. It is really the chief point of interest from the refiner's viewpoint, except that, as already suggested, he should not accept unnecessarily heavy natural gasoline, or should arrange prices accordingly.

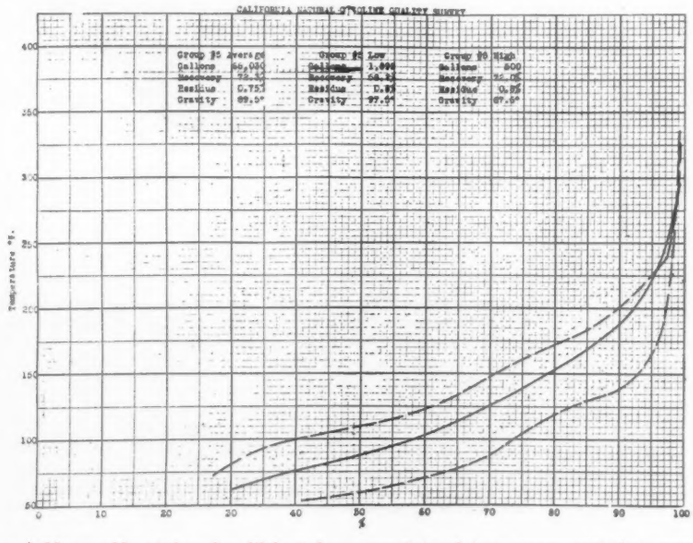
Now if the refiner adopted such rules, the natural gasoline manufacturer would immediately endeavor to make as large a quantity as possible and yet meet the required vapor pressure, and would probably resort to the degree of rectification which he considered economically feasible. This increase in quantity would tend towards another unbalanced condition, but probably would not be of sufficient degree to be serious, and would after all tend more nearly towards the refiner's requirements in supplying him with low boiling point material, excessively low boiling points being eliminated when necessary.

But to date there seems to be no recognized method of obtaining true vapor pressure of natural gasoline as manufactured in California where high storage pressures and pipe line deliveries are usually the rule. However, we have hopes that this difficulty can be surmounted.

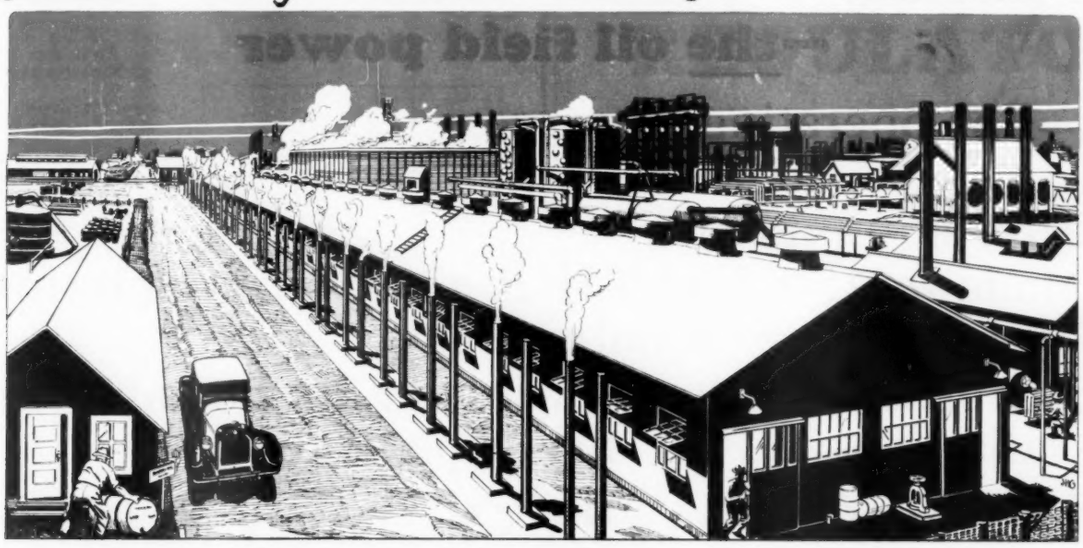
Samples of Tank Pressure

To summarize, we have given a brief statistical report on California natural gasoline on the basis of Engler curves. We trust that this will inform those interested in natural gasoline what sort of gasoline is available, and furthermore where quality improvements without too great quantity sacrifice may be possible in the future. At present we make one specific recommendation: All samples for Engler distillation should be taken at the tank pressure existing at point of sale by means of two connections to the tank, and should be carefully refrigerated to 34 degrees Fahrenheit before transfer to the Engler flask. We also suggest that when refiners wish to limit the Engler curve at a midpoint, they use a 60 per cent reading on reverse-plotted curves. Finally, the results of experimental work in obtaining true vapor pressure of natural gasoline at sales delivery point will be awaited with interest, the outcome to determine further work of this committee. It may be possible at some later date to recommend that vapor pressure and gravity be the only governing factors necessary; other qualifications, such as color, corrosion test, doctor test, and endpoint, to hold in all cases. A distillation test more adaptable to natural gasoline may also be developed.





Phillips own and operate 44 Natural Gasoline Plants—and produce *One-Eighth* of the world's output of Natural Gasoline



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PHILLIPS Aviation Gasoline is serving aggressive modern jobbers in 3 ways:

FIRST: For blending with ordinary gasoline to produce a high grade winter motor fuel.

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THIRD: As an unexcelled *aviation* gasoline. Art Goebel used Phillips Gasoline in his victorious flight from San Francisco to Honolulu in the Woolaroc.

We are now shipping FUEL OIL and GAS OIL from our Borger, Texas, Refinery. Ask for quotations.

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Adapted to either stationary or portable installations and for any type of drive.

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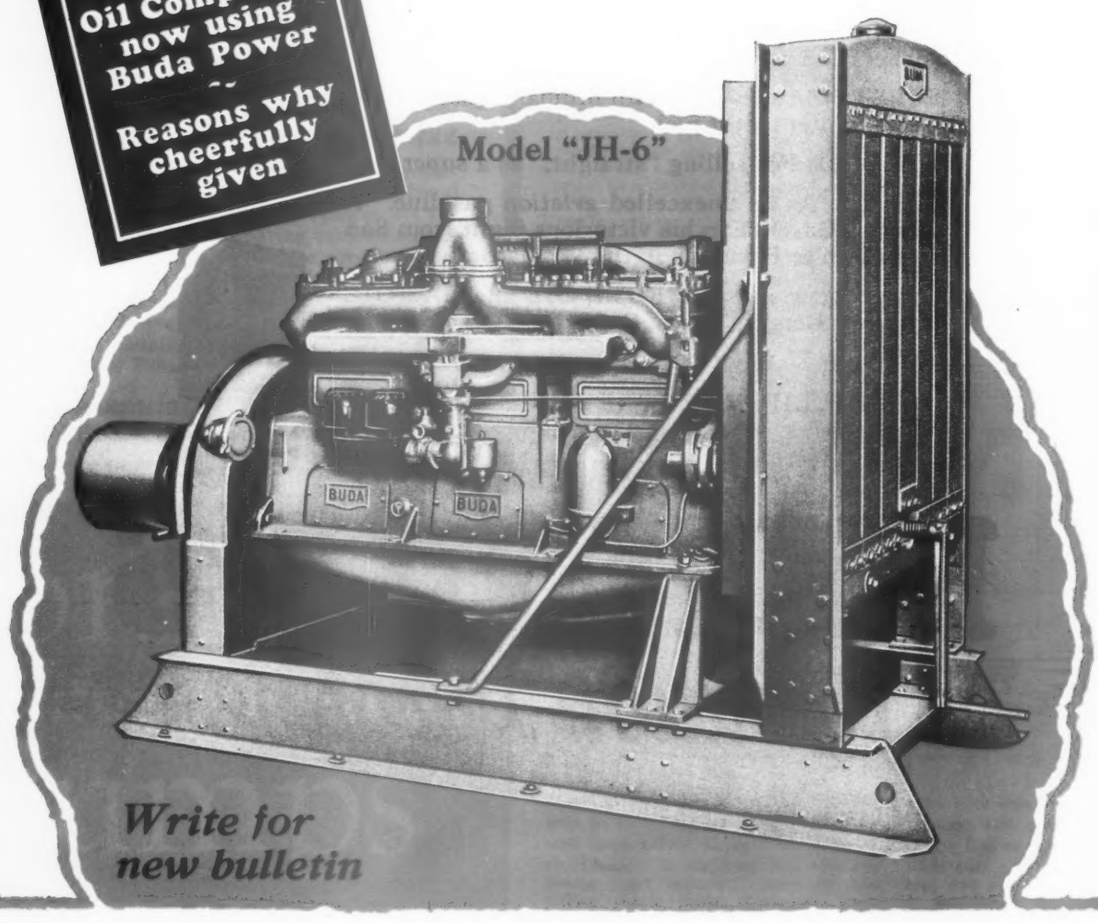


Write for new bulletin

PRODUCTION OF NATURAL GASOLINE BY THE CONSERVATION OF VAPORS

By Wallace G. Palmer*

It is the purpose of this paper to present some recent observations on the conservation of petroleum vapors. By way of preface, it might be stated here that, while some conservation schedules are being pursued with a view to future returns, the production of gasoline by conserving vapors, offers immediate returns.

Broadly speaking, the source of vapors falls into two major divisions:

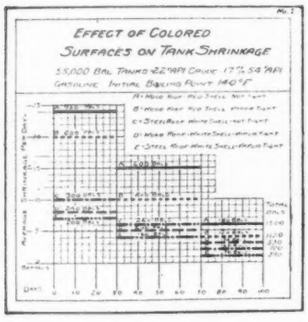
1. Field vapors, from sources other than refining processes, such as crude storage, lease tanks, dehydrators and reservoirs.

2. Refinery vapors, directly connected with refinery processes, such as uncondensed still vapors, vapors from run tanks, from blending tanks, from cracking processes, and from treating plants.

Conservation of Field Vapors

In the actual production of petroleum and natural gas, there exists little need for conservation measures. The oil and gas flow through a trap of some type, from which the oil is discharged to lease tanks, and the gas to the absorption plant gathering system. However, in the process of taking the oil from the trap, some gas is entrained with the oil; and considerable vapor is liberated, due to the turbulence and expansion of the oil on entering the tank. At this point evaporation immediately starts. The plant operator should not overlook this fact. He has not obtained all the gas available; nor has the owner of the lease realized all possible revenue.

Wherever crude is found, there are possibilities for conservation. This is assuming, of course, that the crude has sufficient volatility, at normal temperatures, to produce vapor. Particularly is this true where a gas-gathering system is near, or where the vapor is of sufficient volume and quality to warrant the construction of an absorption plant.



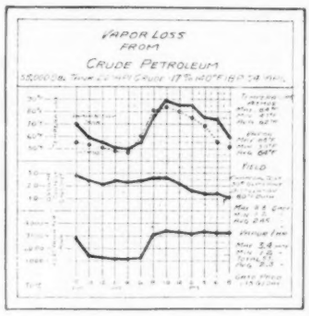
Storage Tank Vapors

To illustrate the fact that evaporation losses are occurring constantly from crude in storage, a slide has been prepared, the data for which having been compiled from authentic and reliable records. While the title of the slide—"The Effect of Colored Exterior Surfaces on Tank Shrinkage"—does not indicate any connection with the subject in hand, nevertheless there is a definite relationship between the two. This crude was stored in several tanks, five of which were selected for tests to determine the effect the color of the shell had on shrinkage. The crude in the tanks, for all practical purposes, had the same characteristics.

You will note the gravity was 22 degrees A.P.I., gasoline content 17 per cent of 54 degrees A.P.I., with an initial boiling point of 140 degrees Fahrenheit. One would naturally think that the high initial boiling point of the gasoline would indicate very little evaporation at normal temperatures. While this reasoning is logical, it does not hold true, as the next slide will show.

Incidentally, this slide may serve as a guide for tank colors. Aluminum paint excels white paint, because white paint turns yellow and loses its reflective qualities. The cheaper grades of aluminum also become dull. This slide points out the necessity for tight tankage.

The amount of gasoline represented by this loss would be considerable. As an illustration of this fact, at an operating recovery plant where an average shrinkage of 4 bbls. per tank per day, over a period of years, had occurred, 1⅓ bbls., or 33 per cent, was recovered. The tankage was not vapor tight, considerable vapor escaping into the air. At this



plant recovery might have been increased to 3½ bbls. per day with vapor-tight tankage.

Due to the inconsistency of quantity and gasoline content of tank vapors, no definite results can be predicted. This paper contains no theories; it represents only what has been observed.

Losses in Crude Tanks

This series of curves illustrates the results of a 24-hour test on the vapors from a 55,000-bbl. tank containing 22 degrees A.P.I. crude with a gasoline content of about 17 per cent of 54 degrees gasoline, initial boiling point of the gasoline being approximately 140 degrees Fahrenheit. It can be said that the initial boiling point of the crude is lower than the initial boiling point of the gasoline produced from that crude. This points toward greater evaporation from crude products than from refined. The majority of tests substantiated this statement. During the test the tank pressure was maintained at atmospheric, by the continuous removal of all excess vapors. The vapors were tested at two-hour intervals by the charcoal method, with 30-pound glycerin distillation, 60 degrees Fahrenheit bath.

This tank had an outage of 4 feet. The roof was wood, covered with insulating paper. The eaves were lead sealed. The tank was vapor tight, within practical limits. At no time during the test was a negative pressure developed. The crude was in storage. From this particular tank about 55,000 cubic feet per 24 hours was removed. The average gasoline content was about 2½ gallons per 1,000 cubic feet. The indicated available amount of gasoline from this source was 135 gallons.

The above curves are typical of results obtained, covering a period of three months, from several tests on vapors of various petroleum commodities. Your attention is directed to the fact that a reduction in tank vapor temperature or pressure results in a decrease of the vapor quantity and an increase in the gasoline content. In this set of curves this fact is not so apparent as in the succeeding set.

Crude Naphtha

Note the relationship between temperature, gasoline contents, and vapor quantity. The contents of this 55,000-bbl. water-top tank was crude naphtha for refining purposes. This naphtha was a cut out of the crude, shown on slide 2. The outage of the tank was 12 feet. From this source 30,000 cubic feet of vapor per 24 hours was obtained, containing an average of 4.6 gallons per 1,000 cubic feet. This is equivalent to a

*Fall meeting, California Natural Gasoline Association, November 15 and 16.

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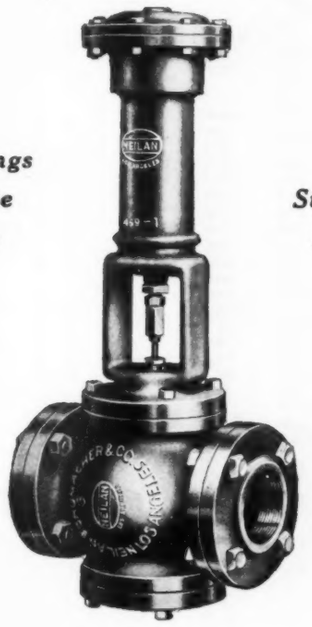
BOILER GAS REGULATOR



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Ball bearings eliminate friction, sticking or binding. Oversize valve ports and large clearance allow free passage of gas. The valves have full inlet pipe capacity and will supply all the gas that can be consumed.

With this regulator in the line it is not necessary to open the by-pass valves for excessive loads as encountered with oil field boilers when making hole at a fast rate, or when cementing off. Once adjusted it will maintain steady, uniform boiler pressure with only slight variation, regardless of changing demands for steam.

For boiler pressure of 75 lbs. to 125 lbs. and 100 lbs. to 175 lbs. Data on Request.

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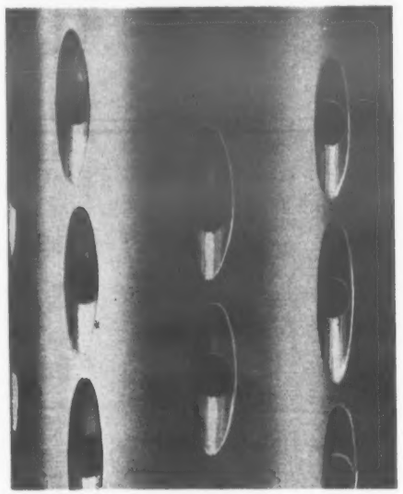
By the New "Milled Groove"—The Most Important Announcement of Screen Improvement Since the Development of Layne Screen

The New Hole Makes a Whole Lot of Difference



Pipe Now "Mill Grooved." Notice the greatly enlarged inflow area as compared with the straight drilled hole—

Keystone Wire Wrap is further strengthened by *Solder* —a heavy band top and bottom and lines the length of the screen.

Strong Wire Wrap is ac-

On these two pages is illustrated a most important development in oil and water well screen design—one of unusual interest and benefit to the industry.

The Layne Patent Keystone Wire-Wrapped Screen, the most widely and extensively used screen in the world today, has been still further improved by this latest feature.

A Much Enlarged Inlet Area Without the Weakening of the Screen

Our engineers, with their years of practical experience in solving screen problems, thought this idea of the milled grooved holes a good one—leading oil companies have just completed tests that prove conclusively that the new improved Layne screen gives *still greater production,* and are most enthusiastic about this achievement.

Observe the maximum inlet area provided by the oblong grooved holes milled in the pipe. Notice that the fluid now has to flow but a short distance before passing through the screen and that the sloped surface of the hole can receive oil directly through the openings from between ten or twelve wires.

Since ten to twelve wraps of wire pass over each groove, excessive production over the drilled holes is avoided as a uniform feed of the fluid through the outer openings of the screen is continually fed through the drilled holes from the entire surface of the screen. This avoids the possibility of "sand cutting," which is occasioned by excessive velocity of fluid entering at any one point.

Grooves are so spaced that the drainage distance between the Keystone Wires is very short, eliminating

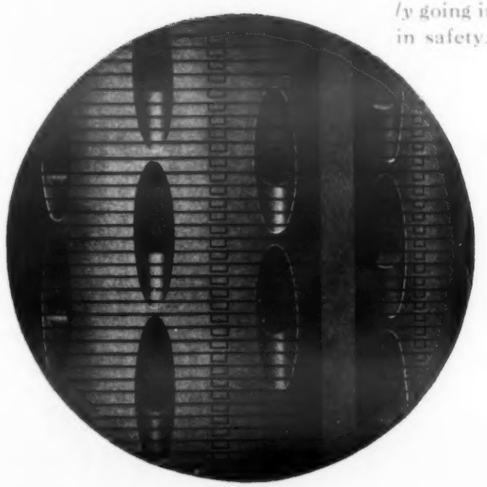
fluid entering at any one point.

Grooves are so spaced that the drainage distance between the Keystone Wires is very short, eliminating the possibility of openings becoming clogged with mud or sand.

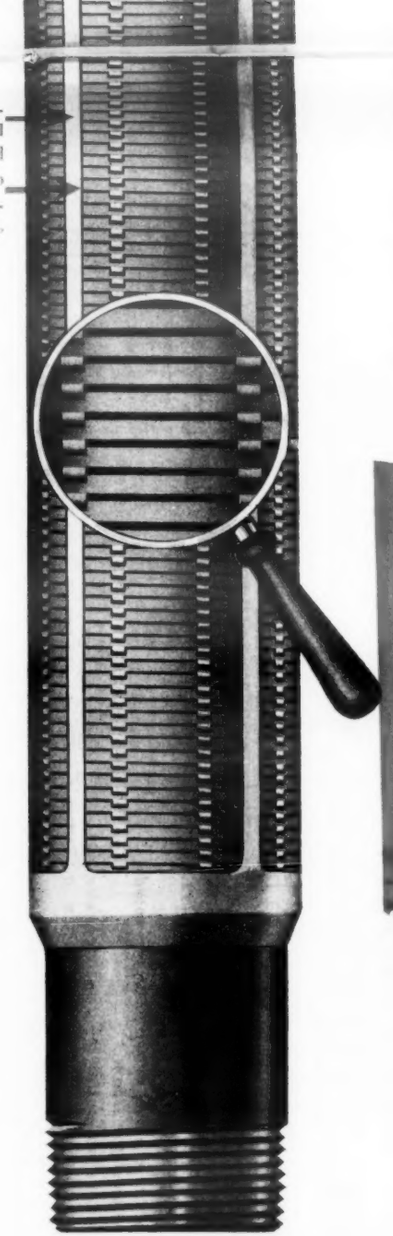
These milled grooves do not weaken the screen body either for tensile strength or collapsing strength.

In every other respect the famous Layne Keystone Wire-Wrapped Screen remains the same with its reputation of safe dependable service, giving maximum production at lowest cost, a reputation builded by a quarter of a century's specialization in the manufacture of screens.

Strong Wire Wrap is accurately spaced and held permanent by Patented *Lugging*. Nothing to *Catch* or prevent *smoothly* going into hole—*Rotate* in safety.



Notice the number of strands of Keystone Wire *NOW* passing over the pipe inlet—giving a distributed flow of the fluid from the entire surface—and but a short distance to flow before passing thru the screen—



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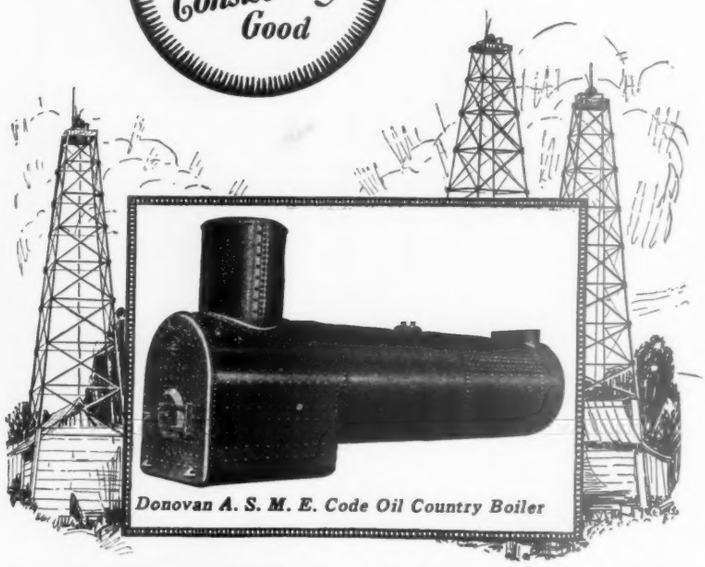
Donovan Boilers are Consistently Good



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"I never have to fire them hard, never have to crowd them, and never have to wait for steam.

"These boilers hog it thru no matter what the depth or formation or anything else and have never given a minute's trouble.

"I am completely sold on DONOVANS."

There you are! Practical men and men who use boilers do not hesitate. When they need boilers, they buy DONOVANS because they know what to expect.

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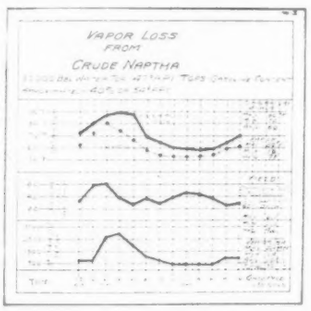
NONE BETTER

production of 138 gallons per day. The contents of this tank were in storage.



The slides you have just seen are the results of actual tests under field conditions. They were selected as representing average conditions.

Tank Evaporation Losses

Test 1—January 12, 1925: Twenty-four hour test; 28 degrees Baume gravity refining crude; 55,000-bbl. tank, wood top, paper covered, lead seal around edges, (vapor tight); 24 per cent, 54 degrees Baume gasoline, (gasoline content); atmospheric temperature, 61 degrees Fahrenheit average; vapor temperature of tank, 69 degrees Fahrenheit average; yield, gallons of gasoline/m.c.f. of vapor, 1.9 average; total vapor from tank/24 hours, 53,520 c.f.; anticipated production/24 hours, 106 gallons.

Test 2—June 9, 1925: Twenty-four hour test; 54 degrees Baume gravity gasoline; 55,000-bbl. tank, water top; atmospheric temperature, 63 degrees Fahrenheit average; vapor temperature, 71 degrees Fahrenheit average; yield, gallons of gasoline/m.c.f. of vapor 4.2 average; total vapor from tank/24 hours, 58,080 c.f.; anticipated production/24 hours, 245 gallons.

Test 3—June 11, 1925: Twenty-four hour test; 47 degrees Baume gravity gasoline; 55,000-bbl. tank, wood top, paper covered, fairly vapor tight; atmospheric temperature 61 degrees Fahrenheit average; vapor temperature, 66 degrees Fahrenheit average; Yield, gallons of gasoline/m.c.f. of vapor 1.8; total vapors from tank/24 hours, 44,880 c.f.; anticipated production/24 hours, 82 gallons.

Test 4—August 4, 1925: Twenty-four hour test; 48 degrees Baume crude naphtha; 65 per cent, 54 degrees Baume gasoline content; 55,000-bbl. tank, water top; atmospheric temperature, 61 degrees Fahrenheit average; vapor temperature, 70 degrees Fahrenheit average; yield, gallons/m.c.f. of vapor 3.8; total vapors from tank/24 hours, 29,110 c.f.; anticipated production/24 hours, 110 gallons.

Test 5—August 6, 1925: Twenty-four hour test; 27/3 degrees Baume gravity refining crude; 23.6 per cent, 54 degrees Baume gasoline content; 80,000-bbl. tank, steel cone top, vapor tight; atmospheric temperature, 60 degrees Fahrenheit average; vapor temperature, 70 degrees Fahrenheit average; yield, gallons of gasoline/m.c.f. of vapor 2.03; total vapor from tank/24 hours, 13,440 c.f.; anticipated production/24 hours, 27 gallons.

Lease or Run Tanks

Vapors from this source will vary in gasoline content from 0.6 to 5 gallons per 1,000 cubic feet, depending on the crude. Several tests conducted on these vapors demonstrated that no one conclusion could be applied to any other situation than the one from which the conclusion was derived. One installation on 21 degrees A.P.I. crude indicated 80,000 to 120,000 cubic feet per 24 hours of 1.01 gallons gas. This was from a 500-bbl. well flowing through a trap.

Dehydrator Vapors

These vapors may have a gasoline content of from 2 to 16 gallons per 1,000 cubic feet, with the oil of from 24 degrees A.P.I. to 36 degrees A.P.I. at a temperature of from 150 degrees to 180 degrees Fahrenheit. A loss of from 1.5 per cent to 2.2 per cent of volume throughout has been observed. At least 1 gallon of gasoline for every 5 to 7 bbls. throughput should be recovered. The vapor yield from this source was inconsistent, due to varying water content of the crude. Vapor quantities determined averaged 55,000 cubic feet per 1,500 bbls. throughput.

Reservoir Vapors

These vapors indicate gasoline content of from 0.5 to 1.6 gallons per 1,000 cubic feet. Vapor quantities handled have varied between 200,000 and 500,000 cubic feet per 24 hours, from a 750,000-bbl. reservoir. These figures do not represent the total available vapors, for the handling of the peak discharge is considered impracticable.

Before discussing the ideal conditions under which the control of tank vapors can be handled, the following three general statements at this juncture seem to be in order:

1. To insure the profitable recovery of vapors, the tanks, or source of vapor, must be tight. Recommending that tanks be tight seems absurd. However, many lease and storage tanks are still without suitable roofs, or any roofs at all. Why this condition exists is hard to explain, when merely a water-top roof has in some cases increased the gravity of the crude 2 degrees.

2. All tanks should be equipped with adequate relief valves, vapor-tight swing-pipe stuffing boxes, and gauging holes for conservation purposes, not to mention fire prevention.

3. There are many available types of tank relief or breather valves. In the purchase of these valves the buyer should give due consideration to the matter of size and design.

Ideal Conditions

The following are ideal conditions for tank vapor control:

1. Maintain the tank pressure at approximately atmospheric. This condition eliminates excessive roof weaving and prevents the evaporation of the volatile fractions due to negative pressure, resulting in higher gravity for the crude. The evaporation that does take place under atmospheric pressure can be considered normal. Of course it would be to the advantage of the plant operator to hold the tanks under slight vacuum; to the lease operator, slight pressure. One installation that came under observation showed an increase of 1.3 degrees A.P.I. in the gravity of the crude by maintaining a half-inch water pressure on the tank.

2. Prevent the intake of air to the tank through breathing. The greatest advantage of air-content reduction is the prevention of explosive mixtures. Tests have indicated 50 to 90 per cent air in tank vapors, where atmospheric breathing had been apparent. Two preventive methods have been developed—the return of dry gas or flue gas to the tank, and the use of breather bags or gas holders. It has been possible by the return of dry gas to reduce the air content to 10 per cent.

Another advantage lies in reduced insurance premiums, running in some cases as high as 35 per cent.

A third advantage is found in the prevention of absorption oil oxydation at the plant. A fourth advantage is the partial elimination of emulsification in the plant, which reduces maintenance charges. This condition depends directly on the degree of elimination of water vapor from the tank vapor.

A fifth advantage may be cited. A higher yield results from the vapor, due to the absence of a foreign gas.

A sixth advantage is the decrease in roof corrosion. This has reference particularly to the presence of water vapor in connection with crude containing sulphur.

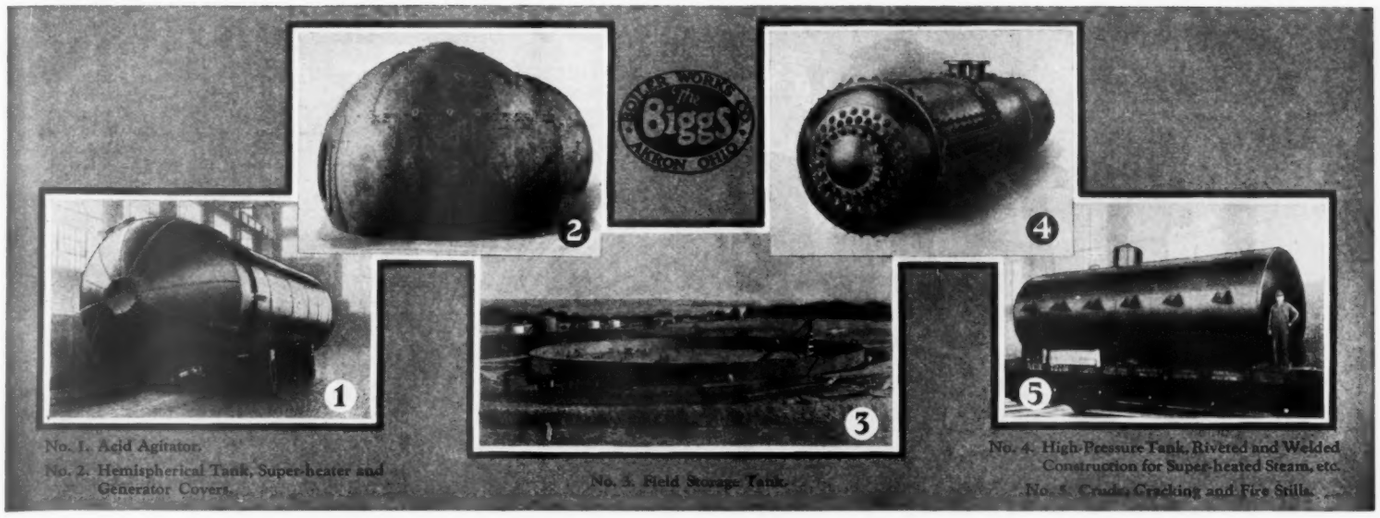
A seventh and final advantage is the lessening of fire hazard, with special reference to interconnected tanks.

3. Prevent the discharge of vapor to the atmosphere. This waste constitutes an economic loss.

Type of Equipment

The three major conditions just cited necessitated the development of equipment suitable thereto. This equipment constitutes a tank vapor control valve. Two types have been developed, direct

(Continued on Page 242)



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NORTH LA.-ARK.

(Continued from Page 69)

at 3,077 feet. Belchic & Laskey have derrick up on No. 1 Dodson, a new location 165 feet north and 650 feet west, SE cor. NE NW, Section 22-23-12. Magnolia Petroleum Co.'s No. 1 D. W. Roberson, Section 26-23-12, is drilling shale at 1,903 feet. O'Brien Brothers, drilling No. 1 Dodson in Section 22-23-12, at 2,860 feet, have made location and have derrick up for No. 1 Farrington, 660 feet south and west, NE cor., Section 21-23-12. Woodley & Collins made a Halliburton test on No. 1 L. & A., Section 15-23-12, which showed for 4,000,000 feet of gas with a spray of oil in 4 feet of sand 3,083-87 feet and will set 6-inch casing at 3,078 feet to test for completion.

Bellevue and Sligo—Humble Oil & Refining Co.'s No. 30 Bliss & Wetherbee, Section 15-19-11, is shut down at 4,531 feet for repairs to the rig. Palmer Corp. has made location for No. 1 Lewis Burke, 980 feet south and 710 feet west of the SE cor., Section 26-17-12, which will probably be a test for the deep gas tapped by Triangle Drilling Co.'s No. 1 Jeter in Section 23-17-12 at 4,272 feet.

Caddo Parish

Pine Island—Arkansas Natural Gas Co. bailed at 3,945 feet in No. 1 C. W. Lane, Section 13-21-15, and is drilling at 3,950 feet. Dixie Oil Co. is drilling No. 9 Clark, Section 14-21-15, at 3,060 feet and is arranging to test No. 9 Caddo Mineral Lands in Section 23-21-15 at 3,909 feet; No. 92 Dillon, Section 13-21-15, set 15½-inch casing at 159 feet and No. 4 H. H. Huckaby in Section 11-21-15, is rigging up to resume drilling after the fire which destroyed the derrick last week; total depth 2,742 feet. Double H Oil Co. has derrick up for No. 1 Watkins, a new location 100 feet south and 175 feet east, NW cor. NE NE, Section 27-21-15.

Magnolia Petroleum Co. is drilling lime at 3,382 feet in No. 8-A Hampton, Section 15-21-15; No. 21 Robertshaw, Section 23-21-15, is drilling lime and shale at 3,790 feet; No. 22 Robertshaw is in lime at 2,482 feet. Ohio Oil Co.'s No. 25 E. K. Smith, Section 12-21-15, is drilling at 5,180 feet. Palmer Corp.'s No. 1 Sellington, Section 17-21-15, is down 3,914 feet in lime and shale. Simplex Oil Co.'s No. 4 Thomas, Section 15-20-15, is waiting on standard rig at 2,208 feet and they have rig up for No. 1 Hunsicker, a new location in the same section.

The Texas Company is fishing for a number of joints of 4½-inch casing dropped in No. 50 Caddo Mineral Lands, Section 23-21-15, total depth 3,941 feet and No. 51 is drilling lime at 3,834 feet; No. 8 A. Herndon, a new location 2,380 feet north and 1,043 feet east of the SW cor., Section 14-21-15, is rigging up; No. 10 J. K. Herold, in the same section, is drilling at 3,689 feet; No. 10 Mabry in Section 15-21-15, is in lime at 3,767 feet; No. 14-B Noel, which showed for 40 bbls. oil with 300 bbls. of salt water is waiting on installation of equipment to blow with air, total depth 3,050 feet, and No. 19 D. H. Raines, Section 15-21-15, which lost the drill stem and had a long fishing job is arranging to take a core at 4,025 feet.

Greenwood—Belchic & Laskey have made location for No. 3 P. A. Sharp, 3,300 feet north and 660 feet west, SE cor., Section 10-18-16. Magnolia Petroleum Co. cored green sand in No. 1 J. W. Furrh, Section 28-18-16, at 1,983 feet and has temporarily abandoned the test at that depth; No. 1 John Furrh, Section 32-18-16, is in gumbo at 2,074 feet. State Line Oil & Gas Co. cemented 6-inch casing at 905 feet in No. 1 Amanda Sharp, Section 22-18-16, and is drilling at 914 feet. Waterman Brick & Tile Co. of Waskom, Tex., has derrick up for No. 1 Waterman Lumber Co., 150 feet south and 300 feet east of the NW cor., Section 18-17-16, and will drill for fuel for its brick kilns at Waskom.

Vivian, Hosston and Oil City districts—Standard Oil Co.'s No. 54 Helpman, Section 16-21-16, reamed to bottom and reset 4½-inch casing and showed a little oil when bailed down to the top of liner, total depth 2,353 feet.

DeSoto Parish

American Controlled Oil Co. began drilling No. 2 Lanier, Section 5-11-11, November 18, set 10-inch at 110 feet and is drilling at 1,450 feet. Dixie Oil Co.'s No. 1 Jenkins, Section 9-12-11, made 29 feet through hard lime with cable tools during the week and is making hole at 5,783 feet.

Monroe District

Morehouse Parish—Natural Gas Products Co.'s No. 10 Tensas Delta, Section 27-22-4e, is shut down at 2,250 feet repairing rig. Ouachita Natural Gas Co. cemented surface string of 12½-inch casing at 296 feet in No. 7 Smith, Section 38-20-4e.

Ouachita Parish—Jordan Drilling Co.'s No. 1 Miller, Section 18-18-5e, is in shale at 2,135 feet. Ouachita Natural Gas Co. cemented 6-inch casing at 2,167 feet in No. 2-A D'Arbonne, Section 34-19-3e. Palmer Corp. has derrick pattern on location for No. 1 W. Va. Timber Co., 657 feet west and 637 feet south, NE cor. NW, Section 5-18-4e. Southern Carbon Co. is drilling No. 8 Fairbanks, Section 38-19-4e, at 1,634 feet. United Carbon Co.'s No. 2 Nelson fee is a location 3,300 feet south and 1,960 feet east, NW cor., Section 6-19-5e. West Virginia Oil & Gas Co. has begun drilling No. 1 fee in Section 5-18-4e.

Union Parish—Interstate Natural Gas Co.'s No. 1 Steele, Section 36-20-3e, is drilling 6-inch plug at 2,107 feet.

Richland Parish

Gulf Refining Corp. has begun drilling No. 1 Millsaps, its proposed 5,000-foot test in Section 8-17-6e, set 15½-inch surface string at 120 feet and is reaming to bottom to set second string of 12½-inch casing at 926 feet; No. 2 Wayne Land & Timber Co., in Section 23-16-5e, tested dry at 2,451 feet and is shut down waiting orders at 2,453 feet.

Moody & Seagraves' No. 1-B Hemler, Section 20-16-6e, formerly W. C. Feazel's No. 1 Hemler, is in black shale at 2,115 feet; No. 2-B Hemler, formerly Feazel's No. 2 in Section 6-15-6e, cemented 8-inch casing at 881 feet; No. 1-C Hemler is a new location by Moody & Seagraves in the C S half of SW, Section 29-16-6e; No. 1 LaFleur is a new Moody & Seagraves location in the C W half NW, Section 18-16-6e; No. 1 McClanahan in Section 36-16-5e, cemented 6-inch casing at 2,296 feet; No. 2 McCoy in Section 30-16-6e, cemented 6-inch at 2,303 feet; No. 1 Noble, Section 36-16-5e, cemented 8-inch at 900 feet and No. 1 Osborne, Section 14-15-5e, is drilling at 162 feet.

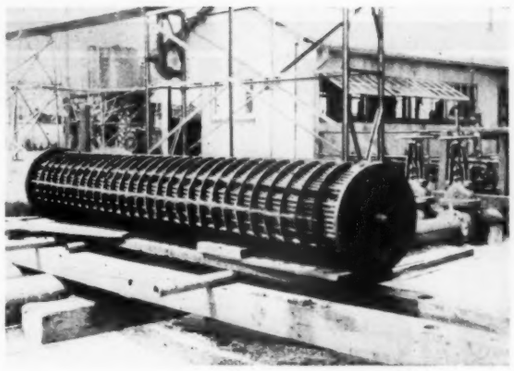
Natural Gas & Fuel Corp.'s No. 1-A Sartor, Section 9-16-6e, is drilling at 1,630 feet after cementing 900 feet of 12½-casing as second string; No. 2-B Sartor in Section 19-16-6e, cemented 10-inch second string at 905 feet and is drilling at 2,270 feet. Roxana Petroleum Co., claiming a show of gas at 2,421 feet in No. 2 Tensas Delta Land Co., Section 1-14-5e, is arranging to set 6¼-inch casing at 2,398 feet for a test. Southern Carbon Co. cemented 12-inch surface string at 826 feet in No. 1 Sartor, Section 20-18-8e. Standard Drilling Co.'s No. 1 Delta Hardwood Co., in Section 22-16-7e, is drilling at 2,786 feet. Stovall Drilling Co. cemented 10-inch casing at 176 feet and is drilling No. 1 Dunning, Section 26-16-6e, at 500 feet.

Sabine Parish

Arkansas Fuel Oil Co.'s No. 11 Logan, Section 32-10-12, is drilling at 3,102 feet; No. 1-A Logan in Section 33-10-12, is cleaning out after drilling through collapsed casing at 2,100 feet, total depth 4,258 feet. Magnolia Petroleum Co.'s No. 2 Rembert, Section 32-10-12, cemented 6⅝-inch casing at 3,180 feet. Moffatt and others are arranging to run tubing in No. 3 Moore, Section 5-9-12, after testing about 30 bbls. of oil and a little gas at 3,332 feet after bailing dry on an oil show at 3,268 feet with sand from 3,251-68 feet. Seip and others have derrick pattern on location for No. 1 Moore, in the NE NE, Section 33-10-12.

Webster Parish

Cotton Valley—Humble Oil & Refining Co.'s No. 1 J. Babb, Section 14-21-10, is drilling at 1,225 feet and No. 1 Gray,



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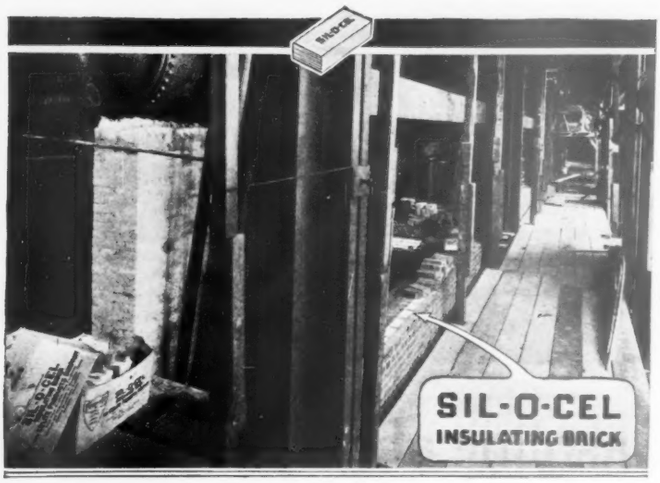

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Section 26-21-10, is down 3,258 feet. Magnolia Petroleum Co. is reaming No. 1 Cole, Section 27-21-10, to the bottom at 2,725 feet; No. 1 D. G. Cox in Section 22-21-10, is changing over to heavier equipment, total depth 2,715 feet.

Ohio Oil Co. is bailing 6⅝-inch casing cemented at 4,258 feet in No. 4 Holloway, Section 23-21-10.

Spring Hill, Shongaloo and Sarepta districts—Arkansas Natural Gas Co. has rig up on location for No. 1 North Central Texas Oil Co., in Section 36-23-10. Magnolia Petroleum Co. cemented 6⅝-inch casing at 2,577 feet in No. 1 Haynesville Mercantile Co., Section 1-22-10. Magnolia Petroleum Co. is in lime at 1,936 feet in No. 1 Newsome, Section 32-23-9; No. 1 Roseberry in Section 29-23-9, is a derrick. Northwest Louisiana Gas Co.'s No. 1 Munn, Section 29-23-9, is still a location.

ARKANSAS

Nevada County

Humble Oil & Refining Co. tested 4 feet of sand 1,136-40 feet in No. 4-B Graves, Section 1-14-21, and is waiting on standard rig to pump. Wright Oil Co. is testing 3 feet of sand 1,148-51 feet in No. 3 Graves, Section 12-14-20.

Union County

Champagnolle—Garrett-Modisette Drilling Co. is drilling cement plug at 2,755 feet in No. 1 Gregory, Section 10-17-14, to test 2 feet of sand which filled four fourbles of 3½-inch drill stem with oil on Johnson test at 2,763-65 feet. Ohio Oil Co.'s No. 3 Crain, Section 1-17-14, is drilling at 2,535 feet; No. 5, in the same section, cemented 10-inch casing at 326 feet and is drilling at 1,430 feet; No. 1 Pumphrey in Section 1-17-14, tested salt water in 4 feet of sand 2,944-48 feet and is running core barrel at 2,954 feet; No. 1 R. Pumphrey, a new location in the NE cor. SE SE, Section 1-17-14, has begun drilling. Rovenger Oil Corp. cored the discovery well, No. 1 McCain in Section 4-17-14, which they are deepening in a search for the sand that is producing from around 3,030 feet in the Ohio Crain wells in Section 1-17-14, all the way from 3,004 to 3,042 feet and have cemented 4½-inch casing at 3,030 feet.

Smackover—Magnolia Petroleum Co. is arranging to cement back to the Graves sand and perforate 6⅝-inch casing in No. 8 Murphy, Section 8-16-15, formerly completed as Broderick & Calvert's No. 7-B Murphy as a 10,000,000-foot gasser, total depth 2,690 feet; No. 7 Wilson, Section 17-16-15, is running core barrel, total depth 2,368 feet. Marine Oil Co. has gone back to No. 8 Hays, Section 4-16-15, completed May 30 this year as a 5,000,000-foot gasser at 2,622 feet and is coring at 2,635 feet. C. E. Murdock tested salt water in 6 feet of sand 2,764-70 feet in No. 2 Murphy, Section 17-16-15, and is arranging to go deeper. Standard Oil Co.'s No. 24 Murphy in Section 4-16-15, an old completion in the Graves sand being deepened to the Blossom, has cemented 4½-inch casing at 2,597 feet.

El Dorado East Side and Lisbon—Grimes Brothers cemented 6⅝-inch casing at 2,226 feet in No. 1 Williams, Section 8-16-14. Rice and others' No. 1 Newton, Section 13-17-16, carried since October 12 as shut down waiting orders following a salt water test at 2,924 feet, is reported this week as waiting on fuel at 3,003 feet.

CALIFORNIA FIELDS

(Continued from Page 72)

Shell Oil Co. with 15 projected deep sand wells, 11 of which are already under way, is the largest single operator in the Long Beach Field at the present time and will probably retain this distinction until the present drilling campaign draws to a close, as this concern holds more potential acreage than any other operator and should therefore be required to maintain a larger drilling program in order to adequately protect its holdings from drainage by drilling offsets.

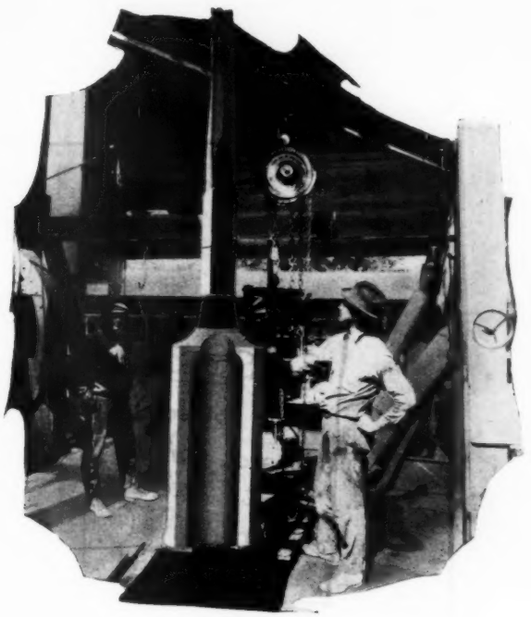
The past week witnessed the completion of another large deep zone well when the Travis Drilling Co. presented H. B. MacMillan with a 3,076-bbl. producer. This new project, which is flowing through a seven-eighths inch bean under a pressure of 750 pounds on the casing, is making 1,500,000 feet of wet gas in addition to the oil which tests 29.1 degrees and shows a cut of 1 per cent. The depth at which this new well was completed, 6,076 feet, has resulted in considerable speculation as to the total probable thickness of the oil-bearing formation at Long Beach as it is the second well to be finished below the 6,000-foot level since the present deepening campaign got under way. The casing record is also of special importance as it will give some idea of the cost involved as well as the time element and present method of finishing these new deep producers. The first 800 feet of hole was protected with a 14-inch stove pipe followed by an 8¼-inch which was landed and cemented at 4,300 feet. The job was finished with a 5¾-inch oil string carrying 675 feet of perforated landed on bottom. As has been stated several times during the past month there is a very definite tendency to drill deeper than has been customary in the past. The California Eastern's No. 1 Masser is a concrete example, for this well, in contrast to most completions listed heretofore, has gone down to 6,225 feet instead of stopping above the 6,000-foot level as many operators have done. This well, upon completion, will be the deepest producer in the Long Beach Field and if it runs true to form it should result in large production as it has been showing plenty of kick for some time. A check of the various drilling projects under way at the present time reveals the fact that we may anticipate the completion of about 10 or 12 new wells between now and the close of the current year. Long Beach daily production will therefore continue its present upward trend until early in 1928 when there should be a sharp break in the field's production curve resulting from the completion of numerous wells in the deep zone which should add another 50,000 bbls. to the daily output of this district before the coming summer draws to a close.

Seal Beach

The possibility of developing commercial production in the deep Kenkel zone in the Alamitos Heights town lot section of the Seal Beach Field has apparently flivvered out, at least the Superior was unable to develop satisfactory production in its No. 1 Kenkel which encountered this heretofore untried zone a few weeks ago. The Superior drilled the Kenkel well down to 6,005 feet, from which point a production test was made. Water trouble prevented the development of commercial production, however, and after a series of tests the hole was plugged back to the 5,550-foot level. The 4½-inch was perforated from 5,000 to 5,550 feet and although the well came in under a natural flow doing 150 bbls. daily the output is still cutting approximately 15 per cent water. Drilling operations in the town lot area are getting smaller each week due to the fact that the period of flush production is over and with the arrival of the pumping stage additional drilling is not warranted.

There are several wells in the town lot section which could be deepened at a cost of around $20,000. Production would be slightly increased by the new hole made but the future ultimate in many cases would probably not even return the additional expenditure necessary. The intensive drilling which has characterized work in the Alamitos Heights town lot area has resulted in the depletion of gas and the exhaustion of the oil-bearing formation to such an extent that the lifting cost per barrel one year from today will be practically prohibitive unless a large number of present producers are shut down or abandoned in the meantime.

Dill & Comstock's No. 1 Alamitos is a good example of what may be expected out around the edge of the structure at the present time. This well, which was redrilled and deepened to 5,340 feet, was put on a pumping test last week but the best it would do was 50 bbls. daily. This same condition may be expected to prevail nearer the top of the Alamitos Heights structure at a little later date. It is a well-known fact that only a limited num-



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provided for individual company meetings. Animated cartoons, emphasizing the results of thoughtlessness, are now being produced as an addition to future motion picture programs. In no other industry and nowhere else in the Petroleum Industry can a service be obtained which offers such a necessary supplement to the individual company Safety program. Eighty-three per cent of the Association's membership are using this service. Your membership entitles you to this service without further cost.

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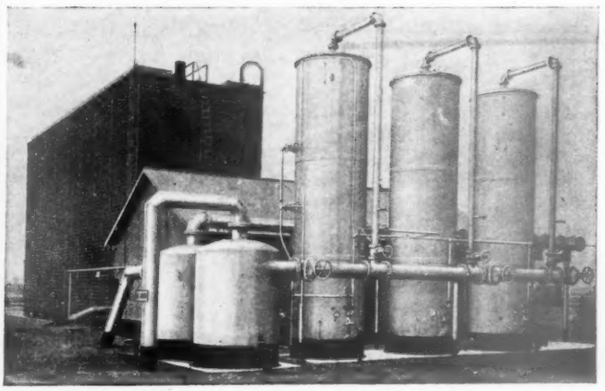

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absorber

ber of wells at Alamitos Heights will ever pay out and, while commenting on the uneconomic situation in the town lot area it would not be amiss to call attention to the fact that conditions in the older section of the Seal Beach Field are in no way comparable to this deplorable state of affairs. The leases in this part of the Seal Beach Field are all held in large blocks by the Associated, Marland and Standard. These three companies are developing their respective acreage in a normal manner and the absence of intensive drilling will result in economic production over a long period of time.

The Marland's No. 1 Selover, which was returned to production during the early part of the week after being redrilled and deepened from 4,745 feet to 4,891 feet shows the latent possibilities of this section of the field as compared with prevailing conditions at Alamitos Heights. No. 1 Selover showed an initial production of 1,325 bbls. of 23.5 gravity oil daily upon recompletion. It came in under a natural flow and when a three-quarter inch bean was cut in the pressure built up to 650 pounds. The Marland has only been doing a limited amount of drilling in the center of the field during the past several months as its efforts during this period have been centered in the extreme northern part of the Selover lease which abuts up against the southern part of the town lot area. The double line of offsets drilled in this area adequately protects the balance of its property from drainage. The Associated finished a new well on the Bryant lease during the past week but this project, which is in the extreme eastern part of the field, only showed a small initial. The well in question was No. 22 Bryant which came in pumping 128 bbls. daily after being plugged back from 5,900 feet to 5,285 feet. Most of the Associated's work at the present time is centered on the Hellman lease, the most easterly productive property in the field, where the company is running three strings of tools. The Standard, like the Marland and Associated, has been keeping its drilling operations down to a minimum for several months.

Rosecrans

R. A. Broomfield celebrated his recent elevation to the presidency of the Barnsdall Oil Co. of California by finishing two wells in the Rosecrans Field, both of which were excellent completions. No. 14 O'Dea, which was redrilled and deepened from 4,918 feet to 5,812 feet, registered an initial of 1,225 bbls., the oil testing 35.5 degrees and showing a cut of 4 per cent. The output cleaned up the following day, however, with a corresponding jump in production to 1,450 bbls., which rate the well has maintained since getting under way. This well, which is producing from the Zins sand, is flowing under a casing pressure of 925 pounds. In addition to the crude output the well is making approximately 1,500,000 feet of saturated gas averaging approximately 4 gallons to the 1,000 feet.

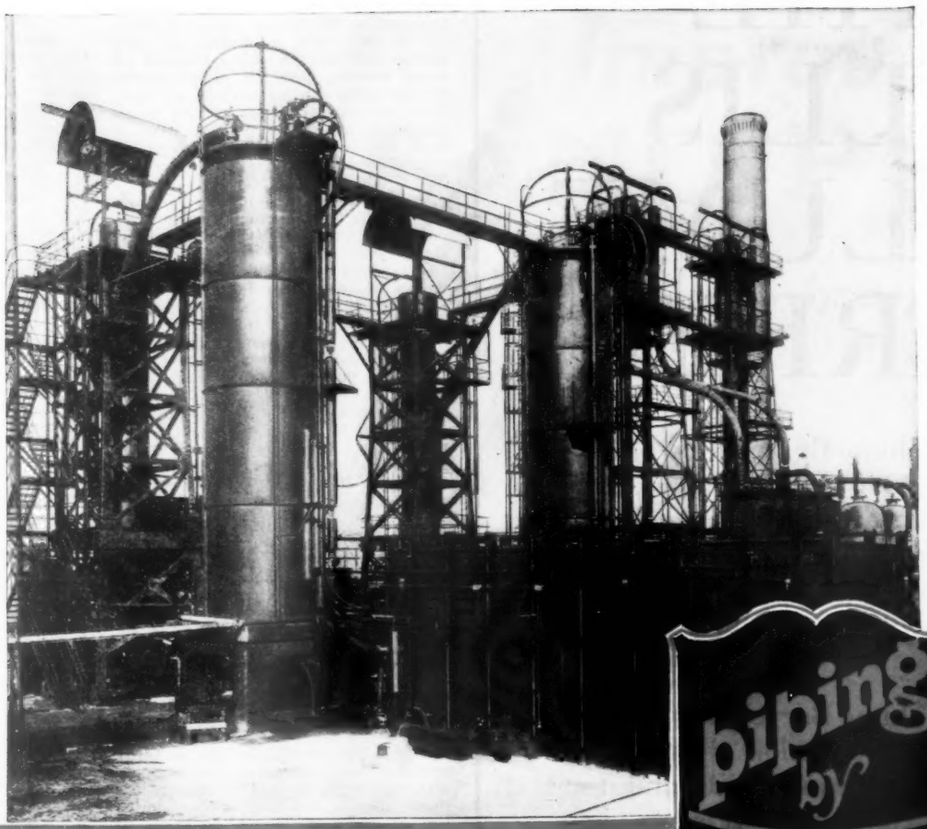
No. 7 O'Dea, the Barnsdall's other successful completion, is probably the most remarkable well ever finished in the Rosecrans Field as it has producer over $900,000 worth of crude and natural gas from the Maxwell zone in the two-year period since the original completion. It was subsequently taken off production and completed in the Hoge sand at 4,944 feet during the early part of the past week, the hole having been finished with a 6-inch oil string carrying 175 feet of 120-mesh screen. The initial production upon recompletion was 1,050 bbls. of clean 38.1 gravity oil daily and the well will undoubtedly hold up for some time before reaching the settled stage. This well, like No. 14 on the same lease, is yielding better than 1,000,000 feet of wet gas per day. The Barnsdall and Union have been sitting tight at Rosecrans for a long time but, notwithstanding this wise policy of curtailing drilling operations until conditions improve with a resulting better price for crude and refined products, both have experienced a satisfactory production during the period in question. The Barnsdall, incidentally, is the largest producer of crude oil in the Rosecrans Field, the company's present production being in excess of 5,000 bbls. per day. The Union finished No. 34 Howard Park a few days ago at an even 5,000 feet but it was a big disappointment as it only resulted in a 120-bbl. pumper, the oil testing 35.5 degrees and showing a cut of 1 per cent.

Seacliff

Developments in the Seacliff Field moved with lightning-like speed during the past week amid charges and counter charges regarding the validity of tide land leases and the right of access thereto. The most interesting phase of the litigation which sprang up almost immediately with the discovery of oil in this new field is the position of the California Highway Commission which has steadfastly refused operators permission to pierce a concrete parapet erected to protect the state highway from inundation at times of high tide. Operators put a fast one over on the commission, however, by moving in several cranes and lifting their equipment over the parapet instead of waiting for permission to open up a driveway. This method has worked out very satisfactorily up to the present time but it cannot be done indefinitely as complaints are already coming in as a result of the traffic jam resulting from these cranes. There seems to be a general movement under way emanating chiefly from Santa Barbara to stop all tideland work at Seacliff and operators will probably experience a rather troublesome condition until the entire situation has been cleaned up. B. B. Meek, chairman of the State Board of Public Works, delivered a rather flowery speech before the Santa Barbara Chamber of Commerce several days ago commenting at length on "desecration of the highway along the Rincon" and advanced this flimsy charge in an effort to retard drilling operations. The legal battle between the General Petroleum and A. L. Hobson should be disposed of one way or the other within the next two weeks. The county of Ventura entered the controversy several days ago by filing an injunction seeking to prevent the General Petroleum from crossing the county park for the purpose of drilling on tidelands. The County of Ventura, which incidentally is supporting A. L. Hobson, contends that the park privilege would be automatically forfeited if the company's employes cross over the land which adjoins the state highway on the ocean side. Practically all of the litigation up to the present time is probably only an introduction as to what may be expected when the matter of the legality of the tideland leases as granted by the State Surveyor General comes before the State Supreme Court for decision on December 5. Drilling operations on fee owned land at Seacliff are going along quite rapidly and several additional wells will get under way within the next week. The Pan American spudded in Nos. 1, 2, and 3 on the Hobson property, subleased from the Chanslor-Canfield Midway Oil Co., and piles are being driven for another project on the state lease. The latter company should spud in two new wells within the next 10 days.

Huntington Beach

Four new wells were put on production in the Huntington Beach Field during the past week, the aggregate initial daily production of this quartet amounting to 850 bbls. Kohlbush & Johnson's No. 1 Wold was the largest well finished as it showed an initial of 475 bbls. daily from 4,340 feet, the hole having been plugged back from 4,406 feet. The Cloud Oil Co.'s No. 1 Huntington was also a satisfactory completion as it started off doing 196 bbls. daily from the 3,865-foot level. Two of the new wells finished this week were completed in the shallow zone around the 2,100-foot level. These were Davis & Haines' No. 1 Huntington, which came in pumping 91 bbls. daily from an even 2,100 feet, and Miller & Van Allen's No. 1 Huntington, which started off doing 88 bbls. daily from 2,110 feet. Two new wells are scheduled to get under way in the town lot section during the coming week, both of which are located in proven territory. These are the Pacific Oil Co.'s No. 3 Huntington and S. W. Lea's No. 3, both of which



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are being rigged up at the present time preparatory to an early spud.

Richfield-Brea Olinda

The Associated finished an excellent new well in the Richfield district during the past week and it has been holding up quite consistently since completion. The well in question was No. 8 Kammerer, which came in under a natural flow making 637 bbls. of clean 24.9 gravity oil daily from 4,405 feet, the hole having been finished with a 6⅝-inch oil string carrying 200 feet of perforated. Several other drilling projects at Richfield are nearing completion and unless something unforeseen develops two or three new wells should be tanking oil within the next 10 days. The Standard's No. 1 Whitehead at Montebello has resolved itself into a real deep test and although no favorable indications of deep production have been encountered up to the present time the outlook at 5,738 feet is not altogether discouraging. The Shell's two deep tests in the Fullerton, or Brea Olinda Field, No. 40 Columbia at 7,114 feet and No. 2-A Puente at 5,827 feet, are both temporarily held up with mechanical trouble resulting from the loss of drill pipe. The Standard finished a small new well over in the Inglewood Field during the early part of the week when No. 63 Baldwin was put on the beam at 1,895 feet. This new well showed an initial pumping of 48 bbls. daily, the oil testing 18.6 degrees and showing a cut of 2 per cent.

Kern River

Two new wells were finished on the Kern front during the past week, one by the Associated and the other by the Chanslor-Canfield Midway Oil Co. The former's new producer was No. 45 in Section 23-28-27, which registered an initial of 135 bbls. daily from 2,298 feet. The latter's contribution during the week was No. 11 in Section 23-28-27, a 130-bbl. pumper from the 2,309-foot level. No. 10 in the same section was also completed during the week and, while it was not actually turned loose, this formality should be concluded within the next several days. The Standard should also finish another new well or two during the coming week as the oil string is scheduled to be run in two wells tomorrow. There has been no marked change in drilling operations at Round Mountain during the past 30 days and it is quite evident that the Shell will hold back production in this district during the next several months although this period will probably be spent in exploratory work such as has characterized the company's operations at Mount Poso. Lack of pipe line facilities limits the production to that required for fuel and road building purposes. This will not prevent the company from drilling several new wells in order to determine the limits of the field, a method which has been employed to advantage at Mount Poso. This prospecting work will not be reflected in state production as these wells are shut in immediately after completion. The California Petroleum is abandoning its No. 1 Grimes at Round Mountain in Section 14-28-28, as a duster 3,040 feet. The next abandonment in this area will probably be the St. Helens Petroleum Co.'s test in Section 13-28-28, which is still dry at 3,199 feet.

Northern California Wildcats

The Edison, Union Avenue and Fruitvale districts of Kern County continue to be the most important wildcat areas under development in Northern California and these sections will bear close watching during the course of the next several months. The Pacific Eastern has started to redrill and deepen its Union Avenue wildcat at Bakersfield and this hole will be carried down for a conclusive deep test following the failure to develop commercial production in the upper sand at 4,503 feet. Another well is contemplated for this immediate section but actual drilling may probably be held up pending the outcome of the initial test. The Pacific Eastern's Fruitvale wildcat, about 5 miles north of the Union Avenue well, has not yet reached the projected depth at which the pay is expected but should do so some time within the next two or three weeks. The Associated, Shell, Barnsdall, Standard and George F. Getty acquired additional protective holdings in this locality during the past week or 10 days. The General Petroleum's wildcat at Edison, south of Union Avenue, has encountered several favorable indications and the outlook is rather favorable for production. The Marland Oil Co. leased an additional 600 acres in the Edison section recently paying a cash bonus of $12,000. The California Petroleum, George F. Getty and the Westland Development Co. also closed leases in this section recently. The Shell is abandoning No. 1 Murphy, a wildcat in Sonoma County, as a duster at 6,382 feet. This is the deepest hole of record in this section of the state and it is regarded as a satisfactory test.

Southern California Wildcats

There were no developments of particular interest in Southern California wildcatting circles during the past week and there does not seem to be a single outstanding test under way at the present time. The Associated's No. 1 Patterson, a wildcat at Pico, may possibly prove this assumption to be erroneous notwithstanding the fact that this location is out of line with the other fields opened up in the basin and hence does not look as favorable. The Associated, while it hopes for production, recognizes the fact that this area presents a different condition and as it was not selected by the projection method its success is problematical. No. 1 Cypress, the discovery well at Potrero, which was taken off production a short time after being finished because of water trouble, cored a very satisfactory oil sand at 5,210 feet and this well may possibly be on production again within the next two weeks.

ROCKY MOUNTAIN AREA

(Continued from Page 63)

Neis, NW NW Section 7-5-29, is drilling at 795 feet.

Clovis Well Shut Down

In Curry County, Clovis Oil & Gas Co.'s No. 1 Hoskinson, NE Section 21-3-36, is shut down and probably will not resume for another month. Water was shut off at 3,670 feet.

In Guadalupe County, the Hanchett Oil Co.'s No. 1 Rutherford, SW NE Section 24-8-24, has 2,000 feet of water in the hole at a total depth of 4,039 feet. The 6⅝-inch casing will be lowered to make a shutoff. There was a small show of gas at 4,000 feet.

In Valencia County, the Acme Development Co.'s No. 1 Santa Fe Railway, SW NW Section 27-7-4, has resumed drilling after cleaning up a fishing job, and is in broken lime at 2,138 feet and carrying the 8¼-inch at 2,107 feet. The Rio Puerto Oil Co.'s No. 1 Ball, Section 12-6-2, is waiting for cement to set, the 20-inch being set at 290 feet.

In San Juan County, the Continental Oil Co.'s No. 17, on the Santa Fe Co.'s lease in Section 2-29-19, Rattlesnake Dome, has at last reached the old bottom at 3,785 feet and is preparing to run the 8¼-inch casing. This well commenced spudding in September, 1925, as a test to the Pennsylvanian. After passing up two sands in the Dakota with an aggregate production of 2,500 bbls., it ran into numerous difficulties and has made no new hole for the past year. The test probably is the most important drilling in northwestern New Mexico, since it is headed for the Pennsylvanian on a structure that is already producing from the upper horizons. Huntington Park Oil Co.'s No. 1, Section 29-30-9, which is bottomed at 4,160 feet in a sandy shale, probably the top of the Mesa Verde, and making 100,000 feet of gas, is running 5⅜-inch casing.

Utah

The Utah Southern Oil Co. is having the same difficulty in making a test of the 2,025-foot horizon in its No. 1 Frank Shafer, Section 6-27-21, Cane Creek Dome, that the former operator experienced. When pumping was resumed the past week, the well made 80 bbls. of oil a day, but the salt precipitated as a solid, clogs the pumping system and cuts

(Continued on Page 264)

The LARKIN Improved SAND PUMP

the best pump for any job— no matter how tough

THE outstanding advantage of the Larkin Improved Sand Pump is its flexibility—in that it operates successfully at all depths, under all conditions. Under normal conditions it will bring out the sand and sediment in record time—equipped with the Regular Bottom.

But—for that tough job, where the cavings have packed hard—there is the Bit Bottom. As its name implies, it is used for drilling and breaking the sand loose. It will break up the hard formations so efficiently, and pass the material through to the pump so quickly, that the pump may be operated at full capacity without being delayed to any extent—even by the worst conditions encountered. To be prepared for any job, no matter how difficult, get the Larkin and have it equipped with both the Regular Bottom and Bit Bottom to give better than ordinary cleaning-out service.

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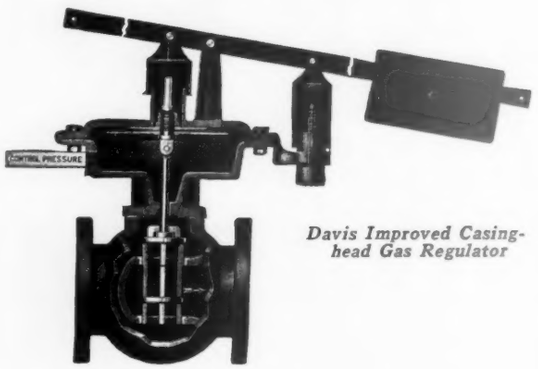

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THIS type of installation of Davis Improved Casing Head Gas Regulators allows accurate, easy adjustment on the vacuum on any well, and all are operated from the one suction line. Any number of wells can be operated from one station, and the exact vacuum desired for each will be maintained automatically regardless of fluctuations in the line vacuum or other operating conditions.

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DAVIS VALVE SPECIALTIES

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NATURAL GASOLINE BY CONSERVING VAPORS

(Continued from Page 230)

acting and indirect acting. The direct-acting type requires only the tank pressure or vacuum to operate it. One make of the direct-acting type consists of two valves operated by a counterbalanced gasometer bell of sufficient size to overcome friction and insure positive, as well as sensitive operations. Negative pressures depress the bell, thereby operating the dry-gas return valve. Positive pressures elevate the bell, opening the vapor-outlet valve. Another make of this type of equipment employs a separate gasometer in the operation of each valve.

The indirect type consists of four diaphram-operated valves, two of which are pilot valves. These pilot valves operate the two main valves, one of which admits dry gas, the other permitting the excess vapors from the tank to escape through a vapor-gathering system. This arrangement calls for an external source of energy to operate the valves.

Control lines are required with both types. These lines transmit the tank pressure directly to the diaphragm, or gasometer, for actuating the valves.

In both types the operating pressure or vacuum that can be maintained on the tanks is as low as one-tenth of an inch of water, provided the lines are of sufficient size to transmit the vapor to the valve, and there is adequate compressor capacity to remove the vapor discharged by the valve.

These valves, when properly installed, can be used in a group control of vapors from several tanks. Because of the expensiveness of tank failures, the selection of proper valves is paramount.

Vapor Gathering Systems

A vapor gathering system consists of two essentials: viz., tank laterals and main lines. In a discussion of tank laterals seven factors present themselves:

1. Determination of pressure and selection of appropriate breather valves for tanks.
2. Size of vapor line from tank to control valve.
3. Trapping of scale.
4. Proper pitching of vapor line.
5. Adequate drainage, provisions and equipment.
6. Installation of control line.
7. Proper location of control valve.

In elaboration of Factor 1, the ensuing pressure table is here presented. These pressures have proven adequate..

	Pressure in Inches of Water Within Tank	Set Relief Valve in Inches of Water
A. Corrugated tanks..	¼-inch	⅝-inch
B. Stand. steel tanks.	¾-inch	1-inch
C. Bolted tanks	⅝-inch	½-inch

Factor 2: The vapor lines from the tank to the control valve must be of sufficient size to deliver the total volume of vapors with a pressure drop not to exceed the tank relief valve setting. The quantity of vapors must be determined for each individual tank, each tank constituting a problem of its own. Herewith are presented data compiled showing the variation in vapor flow. These quantities may be used for estimating purposes:

Storage Tank Vapor Quantities
Cubic Feet per 24 Hours

Tank Capacity	Cubic Feet of Vapor
80,000 bbls.	30,000 to 60,000
55,000 bbls.	25,000 to 50,000
25,000 bbls.	10,000 to 20,000
10,000 bbls.	5,000 to 10,000
5,000 bbls.	2,000 to 5,000

This table does not provide for displacement caused by frequent changes in volume. The displacement per day must be added to the above figures.

Molesworth's formula being conservative, is recommended for line-size calculations.

$$Q = 1{,}000 \sqrt{\frac{d^5 h}{sl}}$$

Q=quantity of gas discharged in cubic feet per hour.
d=diameter of pipe in inches.
h=pressure in inches of water.
s=specific gravity of gas. Air=1 (one.)
l=length of main in yards.

Factor 3: Provision must be made for the trapping and removal of scale before reaching the valve. Scale traps can be secured in the market, or can be constructed, if desired. The type preferable is one that can be cleaned out without stopping operations.

Vapor Lines

Factor 4: Vapor lines must be pitched for drainage in order to eliminate serious consequences. Considerable condensate, water, or gasoline is always present. Pockets are absolutely taboo.

Factor 5: The removal of condensate must be taken care of by suitable drainage equipment. The fact that we have dry gas return lines makes possible the use of return traps. The discharge of these traps can be collected in a centralized accumulator.

Factor 6: The control line, although it does not transmit any of the vapor, must be installed with as much consideration as the tank lateral. Recommendations for the size of the control line are: For distance up to 150 feet, 1½-inch pipe; up to 300 feet, 2-inch, and for greater lengths, 2½-inch or even 3-inch. The control line should be connected directly to the tank, and not to the lateral.

In the group control of tanks, the control line should be connected in a loop system to each tank. This arrangement will operate the control valve on the mean pressure of the group. Drainage of the control line must be continuous. An automatic drain consists of a return bend made into a U-tube seal, installed at the lowest point of the line.

Factor 7: The location of the valve must be as close to tankage as practicable, if not set directly on tank. In the group control of tankage the laterals should connect together equally distant from all tanks, if such an arrangement is feasible.

Main Vapor Lines

The purpose of the main vapor lines is to convey the discharged vapors from the control valves on the tank laterals to the absorption plant. With the exception of No. 6, the same factors presented in the discussion of tank laterals, apply to the main vapor lines.

Just one injunction at this point, and we shall have disposed of the vapor-gathering systems. The lines should be so designed that they will carry their load at no less than 2-inch Hg. vacuum, maintaining at each control valve not less than 1-inch Hg. vacuum, preferably 2-inch, or higher.

Absorption Plant Equipment

From the nature of this paper, just a word will suffice regarding plant equipment. The absorption plant designed to extract gasoline from tank vapors, does not differ materially from one operating on natural gas. The equipment of both plants is practically identical. But in case there is a noticeable difference in the required saturation factors, a corresponding difference in design of equipment should be made.

Plant Products

The products of these plants will vary in gravity from 67 degrees A.P.I. to 95 degrees A.P.I. In fact, some of it is so volatile that the gravity cannot be taken with the standard hydrometer. Initial boiling points will vary from 50 to 85 degrees Fahrenheit. The endpoint is a factor of plant control, and is usually between 340 and 400 degrees Fahrenheit.

The recovery will sometimes fall below 60 per cent, and may run as high as 94 per cent. All factors are variable, and are dependent on the nature of the vapor and its source, as well as the design of the recovery plant. The cost of producing 1 gallon of gasoline will range between 2¼ and 6¼ cents.

General Remarks

It might be interesting to analyze the data of certain field vapor recovery installations. The following plants had been in operation not less than two years at the time these data were obtained. It might have been possible to increase production of these plants from 25 to 50 per cent, had the methods of today been applied. These plants were built during a period when there prevailed higher prices on material, labor and gasoline. These installations were not provided with boiler plants.

The steam was obtained from boiler

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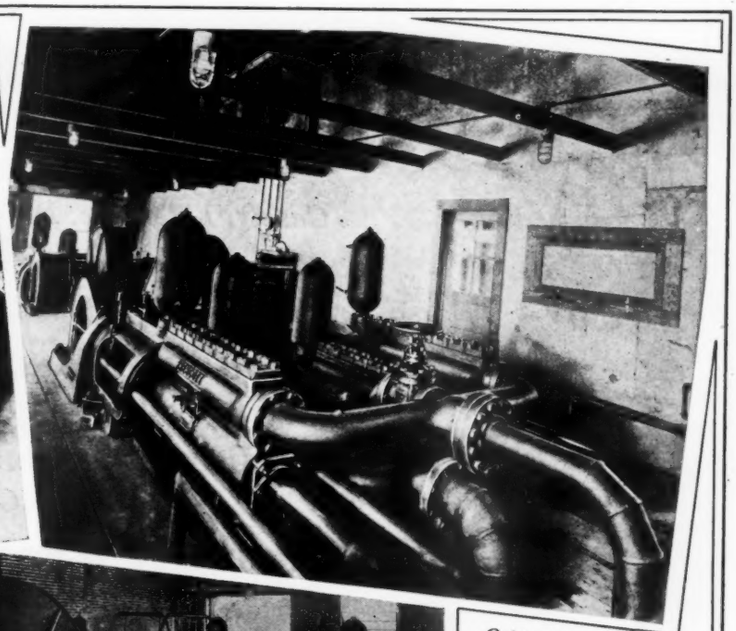
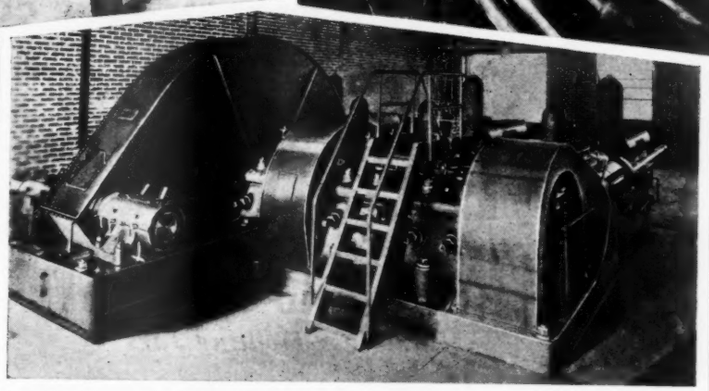


2-12000 Bbl. Capacity
ELECTRIC PUMPS
LIMA STATION
Okla. Pipe Line Co.



40000 Bbl. ELECTRIC PUMP Working pressure 900 lbs per sq in.
KINTA STATION. Oklahoma Pipe Line Co.

Electric Pipe Line Pumps

Dependable Economical
Accessible Sturdy
Capacity Well Built

THE PRESCOTT COMPANY

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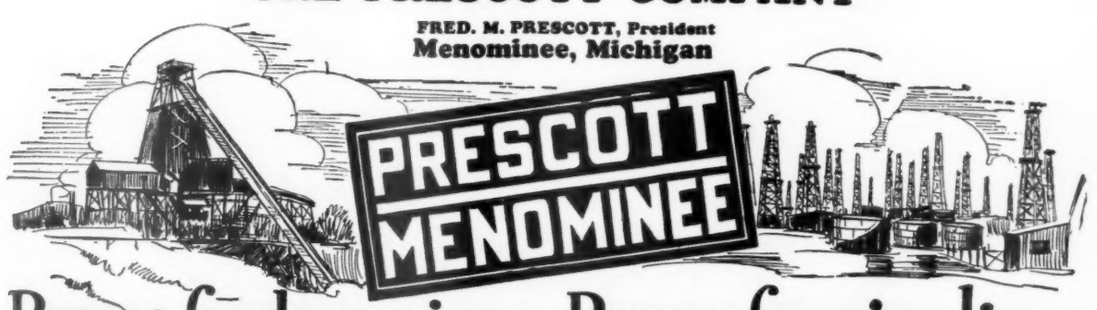

Pumps for deep mines ~ Pumps for pipe lines

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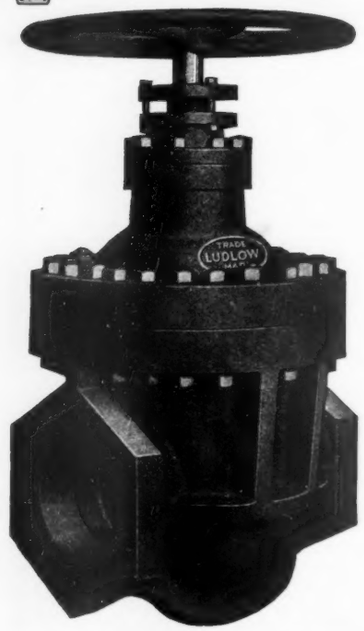
The Ludlow



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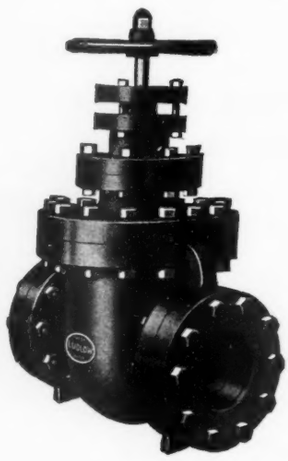
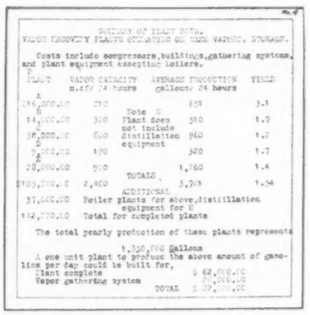


Double Gate Parallel Seat Valve

plants that were supplying near-by leases and pump stations. When an absorption plant is built on a lease, it is not always necessary to increase the personnel. Since the plant operates automatically, the services of a special man may be dispensed with.



SUMMARY OF PLANT DATA.
VAPOR RECOVERY PLANTS UTILIZING OIL VAPOR. STORAGE.

Costs include compressors, buildings, gathering systems, and plant equipment excepting boilers.

PLANT	VAPOR CAPACITY M.c.f./24 hours	AVERAGE PRODUCTION gallons/24 hours	YIELD
A			
$16,000.00	210	Note 1:	6.1
B			
$ 8,000.00	300	Plant does not include distillation equipment	1.7
C			
$ 38,000.00	800		1.2
D			
$ 5,000.00	190		1.7
$ 20,000.00	800	1,760	1.4
$103,000.00	2,400	TOTALS 3,700	1.54
		ADDITIONAL	
$ 7,000.00	Boiler plants for above distillation equipment for 5		
$142,000.00	Total for completed plants		

The total yearly production of these plants represents 1,350,000 Gallons

A one unit plant to produce the above amount of gasoline per day could be built for.

Plant complete	$ 62,000.00
Vapor gathering system	71,000.00
TOTAL	$ 133,000.00

Conservation Plants Operating on Tank Vapors Only

Plant A

210,000 c.f./24 hours of tank vapors.
350 to 900 gallons/24 hours production.
3.1 average yearly plant yield, gallons/m.c.f of vapor.
Source of vapor.
Two 55,000 and two 80,000-bbl. tanks—29 degrees Baume crude—pipe line station.

Plant B

300,000 c.f./24 hours of tank vapors.
250 to 750 gallons/24 hours production.
1.7 average yearly plant yield, gallons/m.c.f. of vapor.
Source of vapor.
Two 750,000-bbl. reservoirs of 28 degrees Baume crude.

Plant C

800,000 c.f./24 hours of tank vapors.
640 to 2,000 gallons/24 hours production.
Yearly plant yield gallons/m.c.f. of vapor 1.2 average.
Source of vapor.
Four 750,000-bbl. reservoirs, seventeen 55,000-bbl. tanks—22 degrees Baume crude.

Plant D

190,000 c.f./24 hours of tank vapors.
180 to 400 gallons/24 hours production.
1.6 average yearly plant yield, gallons/m.c.f. of vapor.
Sour of vapor.
Four 55,000-bbl. tanks—26 degrees Baume crude.

Plant E

900,000 c.f./24 hours of tank vapors.
900 to 1,600 gallons/24 hours production.
1.4 average plant yield, gallons/m.c.f. of vapor.
Source of vapor.
Four 750,000-bbl. reservoirs — 29 degrees Baume crude.

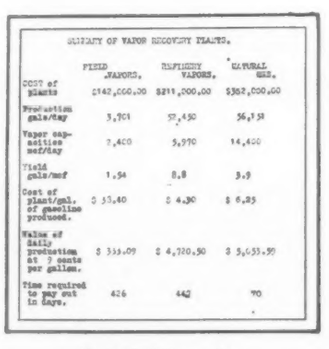
SUMMARY OF PLANT DATA.
VAPOR RECOVERY PLANTS OPERATING ON REFINERY VAPORS.

COSTS include compressors, buildings, gathering systems and plant equipment, excepting boilers.

PLANT	COST	PRODUCTION Gal. / day	VAPOR CAPACITY M.c.f. / day	YIELD Gals./m.c.f
1	$36,000.00	12,750	2,000	6.36
2	$46,000.00	18,000	2,000	9.0
3	$ 8,500.00	600	180	3.3
4	$14,000.00	1,100	290	3.8
5	$68,000.00	20,000	1,500	13.3
	$169,000.00	TOTALS 52,450	5,970	8.8

TOTAL YEARLY production from these plants represents 19,144,250 gallons.
$ 42,000.00 additional for adequate boiler plant.
$211,000.00 Total investment for the above plants completely equped.
An equivalent plant to produce the same amount of gasoline daily from 4 mil. gas can be built for

Plant	$113,000.00
Compressors	99,000.00
Gathering systems	48,000.00
TOTAL	$260,000.00



SUMMARY OF VAPOR RECOVERY PLANTS.

	FIELD VAPORS.	REFINERY VAPORS.	NATURAL GAS.
COST of plants	$142,000.00	$211,000.00	$362,000.00
Production gals/day	3,701	37,450	36,758
Vapor capacities mcf/day	2,400	5,970	14,400
Yield gals/mcf	1.54	8.8	3.9
Cost of plant/gal. of gasoline produced.	$ 53.40	$ 4.30	$ 6.85
Value of daily production at 7 cents per gallon.	$ 333.09	$ 4,720.50	$ 5,053.59
Time required to pay out in days.	426	44?	70

Method of Operation

A word at this stage on methods of operation. Two alternatives present themselves:

1. Contracting the vapors to a plant operator.
2. Building a plant to handle these vapors.

A study of the slide will show that to build a vapor-recovery plant, it will cost, on an average, $38.40 per gallon per day, requiring about 426 days to pay out. On the other hand, a vapor-gathering system can be installed at a cost of from $5.42 to $8.13 per gallon per day, requiring from 120 to 180 days, on a 50 per cent royalty basis, to pay out. In the case of the natural gasoline plant, the cost would be $22.16 per gallon per day, and the plant would pay out in 246 days.

Due to the largeness of the subject and the shortness of the time allotted for giving this paper, it will be impossible at this time to develop Division 2 of the subject—refinery vapors. The few remarks made will be confined to an explanation of the slides prepared for this part of the paper.

KENTUCKY-TENNESSEE

(Continued from Page 76)

of 501 feet of casing with sand from 501-20 feet and shot with 40 uarts, and had an initial production of 10 bbls.

In the Sunnydale Field of Ohio County, Thrasher & Shouse's No. 1, on the Mary Renfrew 53 acres, is reported showing for 35 bbls. initially, and Earl Patton's No. 5, on the Mary E. Wilson 194 acres, showing for 50 bbls. initially.

Daviess County

Daviess County is enthusiastic over the showing made in the well on the W. G. Hayden 168 acres, 4½ miles north of the Maxwell at the Daviess-Ohio County line, southeast of Owensboro. This well is being drilled by L. C. Young of Lexington, and at 8 feet in the sand work was stopped for the day and the following morning the well was slopping over the top of the casing, indicating an unusually good well.

Measurements were made and the hole found to have reached a depth of 1,050 feet with little gas showing with the oil. The Hayden farm well is about 2½ miles north of the McLean Daviess County line and approximately 5½ miles from the Dimmick well in McLean County. Another well making a showing in the deep sand is the one drilling by Jordon & Short on the Gilbert Jolly farm, south a few miles from the Hayden well, east and a little north of the Dimmick well and in Ohio County. These showings would indicate the Kentucky State geological heads were about right when they looked for the best extension westward from the rich Ambrose Pool.

Daviess County has another well making an interesting showing. It is the Ohio Oil Co.'s No. 1, on the Lawrence F. Roby 42 acres, southeast a short distance from St. Lawrence, west of Pellville and between the Roby Pool and St. Lawrence. This well is estimated with an initial close to 100 bbls.

Bert Thompson's No. 1, on the Louis Petrie lease, District 8, is a 5-bbl. pumper and in the southeast corner of the farm. The Tri-County Oil Co.'s No. 2 well, 700 feet from the south line and 400 feet from the west line of the Eli Corder farm, pumped 10 bbls.

CENTRAL WEST

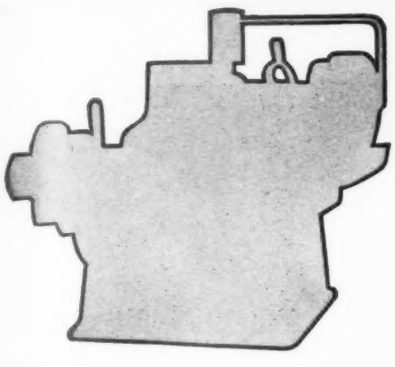
(Continued from Page 76)

farm, in the SW of Section 27, Hopewell Township, Mercer County, which showed an initial production of 11 bbls. by pump. Sand was found at 1,107 feet and drilled 39 feet in the sand.

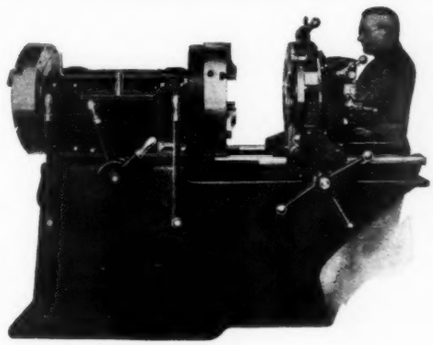
In Mississinewa Township, Darke County, J. G. Hoffman's No. 3 well, 300 feet from the south line and 100 from the east line of the J. Andrew Cox farm, in the northeast of Section 16, pumped an initial of 12 bbls. Sand was topped at 1,121 feet and drilled 47 feet in the sand. The Cole Oil & Gas Co.'s No. 19 on the W. C. Discher farm, Section 11, same township, struck top of sand at 1,218 feet, went 42 feet in the sand and the first 24 hours' production amounted to 15 bbls.

Indiana

Advice from Francisville and Medarysville, in the Kankakee Valley in northwestern Indiana, southeast of Chicago and some 70 miles southwest of South Bend, is that thousands of acres of leases have been taken up in both Jasper and Pulaski Counties, and that large blocks



This threaded pipe represents the output of an ordinary pipe threading machine.



This represents the larger output obtained with the Rapiduction.

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If you snip one die, you replace that one only— and do it in a few seconds. Time is saved in changing dies; less time is spent in regrinding; there's less expense for dies.

This machine has many other fine points; write for the facts complete.

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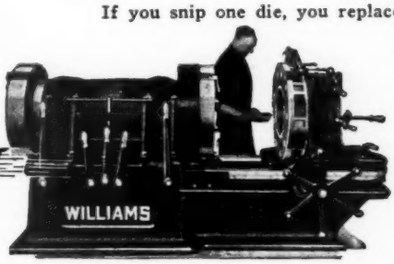

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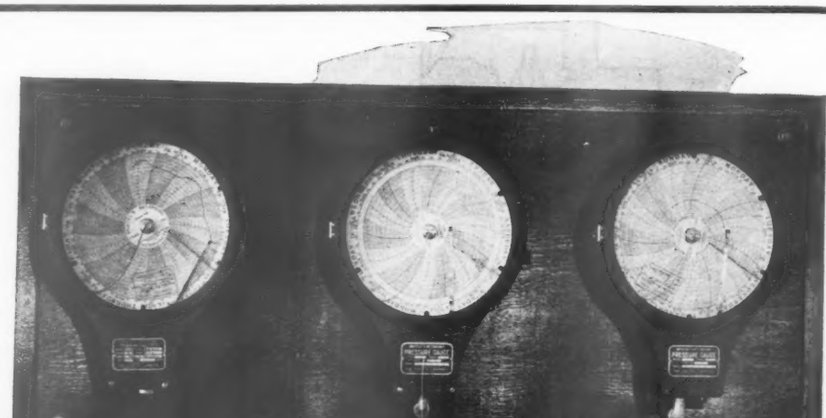

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of land are being taken up in fee simple. Many years ago when the Indiana Trenton Rock Field was in its infancy, numerous wells were drilled in those counties and shallow oil found of a gravity from 17 to 22 and a natural lubricant. The largest well ever reported from that area was in Section 28, Walker Township, Jasper County, which was at that time reported good for 200 bbls. initial This crude was shipped to Chicago and used as a lubricant in its natural state, as that was the only available market, there being no pipe line facilities and in fact never have been, and for that reason these old wells have been dormant for all these years, but there is hope of reviving the field.

Only two completions are reported from Indiana the past several days, both being in Logan Township, Pike County, in the southwestern part of the State. The Wiser Oil Co.'s second test in the northwest corner of the C. Rumble farm, in the SW of Section 13, found the top of the sand at 1,328 feet, and drilled 37 feet in to a total depth of 1,365 feet, shooting with 80 quarts, the initial production being 12 bbls.

In the same township, Perry C. Andrews drilled in his No. 8 well, 450 feet from the north line and 200 from the west line of the A. Atkinson farm, in the NE of Section 23. In this well a sand was found at 1,350 to 1,372 feet and another sand from 1,380 to 1,388 feet and drilled to a total depth of 1,390 feet. Shot with 100 quarts, it failed to make a commercial producer, which is a surprise, as some good wells have been found on the lease.

Illinois

Five completions comes from the Illinois Field, two in Crawford County and three in Wabash County, other areas of the State being rather quiet at this time.

Thomas Flynn and others drilled a test 200 feet from the south line and 600 from the east line of the J. P. Sager farm, in the NW of Section 20, Montgomery Township, Crawford County, getting a duster at a total depth of 1,085 feet. In Martin Township, the Frost Oil Co.'s No. 7 well, 260 feet from the north line and 220 from the east line of the A. W. Mann farm, in the SE of Section 12, Martin Township, pumped an initial of 4 bbls. from a depth of 980 feet.

In the Allendale Field of Wabash Township, Wabash County, the Max Oil Co.'s No. 9 well, 1,600 feet from the north line and 900 from the east line of the Holson-Dorney farm, in the NW of Section 18, pumped an initial of 15 bbls., with top of sand at 1,420 feet and drilled 14 feet in the sand. Joe S. Young, Jr., and others' No. 7 well, 600 feet from the north line and 800 from the east line of the Joe Keyser farm, in the northwest quarter of Section 13, struck top of sand at 1,462 feet and drilled 18 feet deeper, getting an initial production of 10 bbls. J. W. Whiteside and others' No. 4 well, 200 feet from the north line and 1,250 from the east line of the Howard Armstrong farm, in the SE of Section 24, a few miles southeast of Allendale, came in a dry hole at a depth of 1,500 feet.

Central Ohio

Out of 23 completions in the Central Ohio Field, only 3 were oil producers, with an initial production of 37 bbls., 8 were dry holes and 12 gas wells. The best one in the oil wells showed an initial of 30 bbls., and was drilled by the Oko Oil & Gas Co., in No. 15 on the T. W. Brinker property, Lot 6, Section 16, of Chatham Township, Medina County, and in the Chatham Field, which developed some excellent shallow sand producers several years ago. This well is the best completion in that part of the field for many months. The oil was found at a depth of 340 feet. Same company's No. 26 in Lot 10, same section, is only a 2-bbl. pumper.

In Medina Township, Medina County, the Empire Gas & Fuel Co.'s second test in the southwest corner of the C. L. White farm, Lot 37, drilled in a dry hole. M. C. and G. K. Rodgers found one of the same kind at a test 390 feet from the north line and 600 from the east line of the Paul Rerto 50 acres, Lot 35, Lafayette Township. In the same township, the Ohio Fuel Gas Co. is starting a test 700 feet from the south line and 800 from the east line of the John H. Grimm farm, Lot 8.

Ashland County

In Ashland County, Hanover Township, the Logan Gas Co. found an average sized gas well at a test on the David F. Hay farm, Section 19, and the Ohio Fuel Gas Co. is starting a test 660 feet from the south and west lines of the W. B. Cookley 40-acres, Section 20.

In Clear Creek Township, same county, Hulse & Kundtz's test, 184 feet from the north line and 360 from the west line of the Roy Dreher 8 acres, Section 11, came in a duster. The Logan Gas Co. is drilling a second test 415 feet from the south line and 230 from the west line of the James W. Shaw 42 acres, Section 12. The Kemrow Co. is drilling a test 316 feet from the north line and 188 feet from the east line of the J. E. Ringler 10 acres, Section 11, and Faulkner and others are starting a test 60 feet south of the road and 100 feet east of the road, on the Eliza Batdorf 43 acres, Section 14.

In Green Township, same county, the Logan Gas Co. is starting a well 660 feet from the south line and 950 from the east line of the Martin Trumpower 112 acres, Section 32, and the Ohio Fuel Gas Co. is starting a test 1,320 feet from the south line and 600 from the west line of the Jacob Kettering 72 acres, Section 26.

In Troy Township, same county, Hu'se & Kundtz drilled a duster at a test 1,050 feet from the north line and 550 from the east line of the Ray Arnold farm, Section 2, and Arnold, Buffenmyer & Devore also found a dry hole at a test 1,100 feet from the north line and 690 from the west line of a part of the Ray Arnold farm, same section. The Logan Gas Co. is drilling a test 600 feet from north line and 516 from the east line of the S. L. Merkel 50 acres, Section 1, and Hulse & Kundtz are starting a second test 1,000 feet from the north line and 510 from the east line of the R. A. Hartsmiller 50 acres, Section 1.

Lorain County

In Columbia Township, Lorain County, the Ohio Fuel Gas Co. drilled in a light well in a test 660 feet from the north line and 420 from the east line of the John H. Barter 27 acres, Lot 27. It is drilling a test 1,425 feet from the south line and 650 from the east line of the C. L. Burk 79 acres, Lot 5, and starting a test 1,000 feet from the south line and 550 from the west line of the L. D. and J. Richards 50 acres, Lot 4.

Wayne County

Harmon & George brought in a good gas well at a test in the northwest corner of the H. P. Gable 6 acres, Section 8, Chester Township, Wayne County, in the deep Clinton sand. B. B. Cameron is drilling a test 550 feet from the south and west lines of the R. C. McFadden 40 acres, same section.

In Congress Township, same county, the Logan Gas Co. got a fairly nice gas well at a test on the J. C. Cline farm, Section 20. Same company is drilling a test 660 feet from the north and west lines of the Nancy Wagner 160 acres, Section 11, Baughman Township, also drilling a test 660 feet from the north line and 810 from the west line of the J. H. Tschantz 82 acres, Section 15, Salt Creek Township.

Holmes County

The only completion reported from Holmes County was a dry hole drilled by the Logan Gas Co. in a test 530 feet from the south line and 865 from the west line of the Daniel Mosier 80 acres, Section 19, Knox Township.

East Ohio Gas Co. is reported starting a second test on the F. H. and L. E. Garver 20 acres, Lot 18, Kilbuck Township. No. 1 on this farm, drilled early in the year, was an excellent gas well.

Coshocton County

A light gas well was drilled by Cassingham and Bell Brothers in No. 20 well, 200 feet from the creek and south line and 280 feet from the west line of the George Cassingham 319 acres, Lot 5, Newcastle Township, Coshocton County. No. 21, same farm, is drilling.

East Ohio Gas Co. is starting a test 660 feet from the north and east lines of the Peter Shellhouse 40 acres, Lot 2, Monroe Township, same county. The Logan Gas Co. is drilling No. 1, 660 feet

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from the south line and 800 from the east of the D. W. Brillhart 180 acres, Lot 22.

Cuyahoga County

Several gas wells were completed in the Cleveland Field of Cuyahoga County. In Strongville Township, the East Ohio Gas Co.'s test, 450 feet from the north line and 400 from the west line of the J. W. Dorsey 30 acres, Lot 49, is credited with a production of 5 bbls. of oil initial.

In Olmstead Township, Arthur & Simpson have a fairly good gas well in No. 1 well, 475 feet from the south line and 200 from the east line of the H. S. Nelson 60 acres, Lot 22, and an average gas well at a test in the northeast corner of the A. R. Kirk 30 acres, Lot 34. John Arthur is starting No. 1 well, 600 feet from the south line and 325 from the west line of the D. Renton 14 acres, Lot 21, and nearing the sand at No. 1 on the J. Pulse 6 acres, Lot 31.

In the same township, Hulse & Kundtz brought in a good gas well at a test 500 feet from the west line of the M. Standen 73 acres, Lot 29, and located 200 feet north of the road. No. 2 is drilling 325 feet south of the highway and 175 feet from the east line of the same farm. Same firm's second test, 200 feet south of the road and 200 feet from the west line of the O. J. Paddock 60 acres, Lot 30, is an excellent gas well. Same firm is drilling near the sand with a test 650 feet from the north line and 275 from the west line of the A. W. Eldred 55 acres, Lot 29, and starting a second test 450 feet north of the road and 275 feet from the west line of the same farm.

In Olmstead Township, Merkle & Harrison's test in the northeast corner of the M. Paddock 3 acres, Lot 30, is above the average gas producer, while they have a good gasser at No. 4 well in the northeast corner of the W. D. Camp 30 acres, Lot 31. J. B. Harrison and others are starting a test in the northeast corner of the W. D. Camp 3 acres, Lot 30, also a test on the R. Beranek 1-acre tract in Lot 31. H. McClellan's test 200 feet from the north line and 500 from the west ilne of the W. D. Camp 9 acres, Lot 30, is far above the average gas well. No. 2 is drilling, in almost the extreme corner of the same property. The Logan Gas Co. is drilling a test 734 feet from the north line and 250 from the west line of the J. R. Hall 29 acres, Lot 22.

Scattered Development

John Arthur drilled a dry hole at a test on the C. J. Neil 90 acres, Section 7, Richland Township, Summitt County. The well, 500 feet west of the highway and 360 feet from the south line of the farm, was a wildcat.

In Madison Township, Muskingum County, the Logan Gas Co.'s test, 660 feet from the north and west line of the W. C. Copland 145 acres, in the third quarter of the section, proved a duster.

Michigan

Cold wintry weather prevails in the Saginaw Field, and drilling operations are lagging, with no prospects of activity until the spring season comes, when most of the defined territory of the field will be drilled over.

Only one well was reported completed since the last review. It is the Schwinck Oil Co.'s No. 4 on the Schwinck packing house property, reported good for 20 bbls. Wickes Brothers are almost due to bring in their No. 4 on their property on the east side of the Saginaw River, almost in the heart of the city.

EASTERN FIELDS

(Continued from Page 74)

the Miracle Oil Co. of Ohio has completed in the Macksburg sand a second test on the C. H. Caldwell farm. It is a very light pumper. In Section 31, Aurelius Township, the Oneida Oil Co. has completed in the salt sand a test on the German Hall farm. It is a duster. In Section 16, Island Creek Township, Jefferson County, J. E. Turner & Co. have completed and shot in the Berea grit No. 12 on the Sophie Kellemire farm. It produced 24 barrels the first 24 hours.

In the northeast quarter of Section 20, Harrison Township, Perry County, David L. Melick, trustee, completed in the Clinton sand a test on the Frank Tedrow farm. It produced 20 bbls. the first 24 hours after shot. In the northeast quarter of Section 2, Fallsbury Township, Licking County, the Arkansas Fuel Oil Co.'s second test on the E. C. Howell 34 acres is good for 7 bbls. a day in the Berea grit.

Guyahoga County

In the northeast quarter of Lot 32, Strongsville Township, Guyahoga County, John Arthur has a duster at 3,150 feet at his test on the M. Hazlett farm. In Lot 36, Medina Township, Medina County, the Empire Fuel Gas Co.'s second test on the C. L. White farm is a duster at a total depth of 3,250 feet.

In the Fisher pool, Section 24, Alexander Township, Athens County, the Watkins Oil & Gas Co. has a 5-bbl. pumper in the Berea grit at No. 4 on the Mary H. Earhart farm. In the northeast quarter of Section 10, Sutton Township, Meigs County, the Ohio Fuel Supply Co. is drilling a test on the T. J. Mitchell farm. In Section 15, Lawrence Township, Washington County, J. O. Herlan and others have started to drill a test on the James McKendrick farm.

In the northwest quarter of Section 24, Reading Township, Perry County, the Hutchinson Oil & Gas Co. has completed in the Clinton Sand No. 3 on the W. M. Hutchinson farm. It is dry. In Section 6, Athens Township, Athens County, the Strouds Run Oil & Gas Co. has a duster in the Berea grit at a second test on the George H. Junod farm.

In the southeast quarter of Section 2, Cross Creek Township, Jefferson County, O. Palmer and others have completed in the Berea grit a test on the Joseph Stroud farm. It produced 25 bbls. the first 24 hours after shot and is the best well completed in that locality for many months.

In the southwest half of Sutton Township, Meigs County, Edward Calderwood has completed a second test on the Alice Swearingen farm. It is a gasser in the Berea grit good for 240,000 feet. In the same township, the Summer Oil & Gas Co. has completed in the same formation No. 5 on the William D. Roush farm. It is a gasser good for 500,000 feet.

In the northeast quarter of Section 16, Madison Township, Perry County, W. W. and A. T. Wehrle have completed in the Clinton sand a test on the Lucy Teal farm. It is dry at a total depth of 3,510 feet.

Southwest Pennsylvania

In Greene Township, Greene County, the Carnegie Natural Gas Co. has completed in the Big Injun sand a test on the William Blaker farm. It is a fair gasser. In Perry Township, the Peoples Natural Gas Co. has completed a duster in all sands at a test on the Margaret Fostmark farm.

In Richhill Township, Greene County, the Carnegie Natural Gas Co. has a gasser in the Big Injun sand at a second test on the Ella Sowers farm. In Springhill district, the Null Oil & Trust Co. has a light show of oil in the fifth sand on the A. M. Snyder farm.

In Perry Township, Greene County, the Carnegie Natural Gas Co.'s second test on the Alice Henderson farm is a gasser in the 50-foot sand. In Morris township, the same company's test on the J. D. Patterson farm is a duster.

In Springhill Township, Greene County, the Snider Oil & Gas Co.'s test on the A. M. Snider farm is good for 5 bbls. a day in the Fourth sand. In Wayne Township, the Carnegie Gas Co.'s No. 3 on the Israel Yeager farm is a gasser in the Fourth sand.

In the Darlington district, Beaver County, J. L. Abrams and others have completed a second test on the Robert Hites farm. It is good for 2 bbls. a day in the salt sand.

In Jackson Township, Greene County, Milligan & Hoskinson have a Gordon sand gasser at a test on the W. L. Sellers farm. In Aleppo Township, the Dunn Mar Oil & Gas Co.'s test on the Grin-King farm has been drilled through all sands. It is dry and abandoned.

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Problems of great importance will be discussed

openly in group sessions in which the best thought will be given to the most advanced methods of producing, refining and marketing oil and its products. Your attendance will be an indication of your interest in the efforts of petroleum leaders to better serve the industry and the consuming public, and at the same time to practice true conservation.

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Effect of Pinching on Gas-Oil Ratio

Important Facts Regarding Flowing Wells Brought Out in Exhaustive Experiments in Salt Creek Field

By K. B. Nowels*
Petroleum Engineer, United States Bureau of Mines

For the last several years the oil industry has been turning more and more toward conservation and the study of related production problems. It is generally conceded that ultimate recovery is increased by holding the natural gas in the sand which is not needed in lifting the oil. The retained gas lowers the viscosity and surface tension of the oil and helps flow the oil from the sand. Lewis[1] states that "while the operator cannot control the original conditions of energy and resistance in the sand, he can partly control the efficiency of expulsion. As it is the energy contained in the compressed and absorbed gas rather than the oil that is exhausted, it is but logical to judge the efficiency of a producing method largely by the relative quantities of gas produced with each barrel of oil. If by a change in method the producer lessens the proportion of gas with each barrel of oil, he should increase the total recovery of oil correspondingly, even if the rate of production is temporarily reduced somewhat."

The effect of "pinching in" or controlling the flow of oil wells in an effort to lessen the proportion of gas has never been definitely known. The general belief has been that "pinching" a flowing well causes the oil and gas volumes to be reduced proportionately, maintaining the same gas-oil ratio as before the reduction in flow was made. Studies of gas-oil ratios in many fields have shown that much gas has been wasted, insofar as its effectiveness in oil production is concerned. Swigart and Bopp[2] carried on experiments with "stop cocking" and back pressure on pumping wells in an effort to secure the maximum amount of work from gas in bringing oil through the sand into the hole.

With the exception of reports by Brandenthaler[3] and Swigart[4], little information has been published on detailed tests covering methods of producing flowing wells and the effects of pressure control on gas-oil ratios.

This paper describes experiments and records the results of controlling the flow of certain wells in the Salt Creek Field in 1922 and 1923. The field work was performed during the time that the writer

*This paper represents work done under a co-operative agreement between the Bureau of Mines, Department of Commerce, and the University of Wyoming.

[1]Lewis, J. O. Methods for increasing the recovery from oil sands. Bureau of Mines Bull. 148; 1917.

[2]Swigart, T. E., and Bopp, C. R. Experiments on the use of back pressures on oil wells: Bureau of Mines Tech. Paper 322; 1924.

[3]Brandenthaler, R. R.; Sclater, K. C.; Kent, H. M. Engineering report on the Davenport oil field, Lincoln County, Oklahoma: Co-operative report between United States Bureau of Mines, State of Oklahoma, and Bartlesville Chamber of Commerce, June, 1926.

[4]Swigart, T. E. Notes on the efficiency of flowing wells in the Dominguez Field, California: Summary of Operations by California State Mining Bureau, Vol. 10; No. 7; January, 1925.

TABLE 1—RESULTS OF OIL AND GAS PRODUCTION TESTS IN SALT CREEK FIELD EXPRESSED IN AVERAGES

Lgth. of Test (Days)	Test Number and Description	Pressure at casing-head Lbs. per sq. in.	Gas Production Cu. ft. per day: Test	Gas Production Cu. ft. per day: Est. Open Flow Based on Decline	Specific Gravity of Gas	Gaso-line content of gas Gals. per 1,000 cu. ft.	Oil Production Bbls. per Day: Test	Oil Production Bbls. per Day: Est. Open Flow Based on Decline	Gas-Oil Ratio Cu. Ft. per Bbl.: Test	Gas-Oil Ratio Cu. Ft. per Bbl.: Est. Open Flow Based on Decline	Results Expressed as Percentages of Est. Open Flow Gas and Oil Production Based on Decline: Pct. Oil	Pct. Gas	Pct. Gas-Oil Ratio	REMARKS:
	Well "A"—(16A-N.W. 13)—2,050 Feet Deep													
2	No. 1—100 pct. through casing	29	1,141,000	1,141,000	.777	3.20	538	538	2,120	2,120	100.0	100.0	100.0	
3	No. 2— 75 pct. through casing	135	927,000	1,140,000	.770	3.27	422	536	2,198	2,127	78.7	81.3	103.3	
3	No. 3— 50 pct. through casing	255	644,000	1,139,000	.785	3.31	301	533	2,142	2,137	56.4	56.6	100.1	
3	No. 4— 30 pct. through casing	420	345,000	1,138,000	.790	3.31	149	531	2,309	2,143	28.1	30.3	107.7	
2	No. 6—100 pct., ½-in. flow nipple	265	919,714	1,137,000	.737	2.41	415	530	2,226	2,145	78.3	80.9	103.7	In flow line
3	No. 5—100 pct., 9-16 in. flow nipple	215	905,666	1,136,000	.804	3.10	430	530	2,102	2,143	81.1	79.7	98.1	In flow line.
3	No. 5—100 pct., 11-16 in. flow nipple	161	1,001,333	1,135,000	.790	3.03	454	530	2,208	2,141	84.9	88.2	103.1	In flow line.
5	No. 5A—50 pct. ⅝-in. flow nipple	329	636,200	1,128,000	.790	3.07	260	519	2,455	2,173	50.1	56.4	112.9	In flow line, flows by heads.
1	No. 6— 30 pct., 5-16 in. flow nipple	390	441,000	1,134,000	.805	2.81	223	529	1,977	2,144	42.1	38.9	92.2	In flow line.
3	No. 6— 30 pct., ¼-in. flow nipple	420	331,333	1,134,000	.815	3.04	148	529	2,234	2,144	27.9	29.2	104.1	In flow line.
3	No. 7—100 pct., 2-in. tubing	...	917,333	1,133,000	.783	2.61	433	526	2,114	2,152	82.3	81.0	98.2	Bottom of tubing at top of sand.
3	No. 8— 30 pct., 2-in. tubing	...	95,333	1,131,000	1.060	6.50	137	524	716	2,158	26.1	8.4	33.1	Bottom of tubing at top of sand.
3	No. 9—100 pct., 11-16 in. flow nipple	...	936,000	1,129,000	.800	3.14	413	521	2,638	2,166	79.2	82.9	121.7	On bottom of tubing.
5	No. 9A—50 pct., ⅝-in. flow nipple	73	546,800	1,125,000	.833	3.18	266	514	2,075	2,188	51.7	48.6	94.8	On bottom of tubing, flows steadily.
10	No. 10—30 pct., ¼-in. flow nipple	38	361,000	1,122,000	.804	2.77	188	510	1,947	2,200	36.8	32.1	88.5	On bottom of tubing at top of sand.
20	No. 10A—¼-in. flow nipple	335	249,000	1,118,000	.777	2.76	115	503	2,201	2,223	22.8	22.3	99.0	On top and bottom of tubing.
5	No. 11—100 pct., fluid lifter	78	927,200	1,087,000	.744	2.65	228	458	4,078	2,373	49.7	85.3	171.8	Rope-socket fluid-lifter on 2-in. tubing.
8	No. 12—30 pc.., fluid lift	54	336,625	1,084,000	.750	2.61	125	454	2,703	2,388	27.5	31.1	113.1	Rope-socket fluid-lifter on 2-in. tubing.
7	No. 13—100 pct., 2-in. tub. and packer	66	690,571	1,080,000	.768	2.62	343	448	2,838	3,410	54.2	63.9	117.7	Bottom of tubing at top of sand.
7	No. 14—30 pct., 2-in. tub. and packer	297	239,428	1,079,000	.794	3.06	109	445	2,198	2,424	24.4	22.2	90.6	Bottom of tubing at top of sand.
4	No. 15—2-in. tubing and packer	40	232,000	1,075,000	.757	2.72	87	439	2,698	2,448	19.8	21.6	109.8	Produced 30% 24 hrs.; closed 70%.
3	No. 15A—2-in. tubing and packer	41	221,666	1,073,000	.745	2.92	98	437	2,328	2,456	22.4	20.6	94.8	Same test; booster taking gas from trap
	Well "B"—(8A-N.W. 13)—1,998 Feet Deep													
3	No. 1—100 pct. through casing	17	384,000	384,000	.796	3.24	178	178	2,157	2,157	100.0	100.0	100.0	
3	No. 2— 75 pct. through casing	54	353,333	383,700	.786	3.26	133	178	2,656	2,155	74.4	92.1	123.2	
3	No. 3— 50 pct. through casing	225	245,666	383,400	.790	3.43	92	178	2,661	2,154	51.6	64.0	123.5	
3	No. 4— 30 pct. through casing	320	184,333	383,100	.795	3.36	71	177	2,599	2,164	40.1	48.1	120.1	
2	No. 5—100 pc.., ½-in. flow nipple	380	207,000	382,800	.771	3.43	78	177	2,714	2,162	42.9	54.0	125.6	In flow line.
3	No. 5—100 pct., ⅝-in. flow nipple	215	385,000	382,500	.793	3.18	142	177	2,698	2,163	80.3	100.6	124.7	In flow line.
3	No. 5—100 pct., ½-in. flow nipple	136	442,333	382,200	.785	3.00	153	177	2,894	2,159	86.4	115.7	134.0	In flow line.
4	No. 5A—50 pct., 5-16 in. flow nipple	234	450,000	380,900	.762	2.45	88	175	5,136	2,176	50.2	118.1	236.0	In flow line.
3	No. 6—30 pct., 3-16 in. flow nipple	380	124,333	382,000	.809	3.02	40	176	3,106	2,170	22.8	32.5	143.1	In flow line.
3	No. 7—100 pct., 2-in. tubing	...	581,000	381,700	.753	2.23	168	176	3,459	2,167	95.4	152.2	159.5	Bottom of tubing at top of sand.
3	No. 7A—100 pct., 2-in. tubing	...	611,000	381,200	.759	2.70	151	176	3,994	2,165	86.4	160.2	184.4	Extra joint of tubing.
3	No. 8—30 pct., 2-in. tubing	...	190,000	381,500	.790	2.64	53	176	3,569	2,167	30.1	49.8	164.6	Bottom of tubing at top of sand.
5	No. 8-A—30 pct., 2-in. tubing	...	229,000	381,100	.792	3.04	68	175	3,383	2,177	38.8	60.0	155.3	Extra joint of tubing.
6	No. 9—100 pct., 9-16 in. flow nipple	66	448,000	380,000	.753	2.27	125	174	3,590	2,181	71.8	117.9	164.4	On bottom of tubing.
7	No. 9A—50 pct., 5-16 in. flow nipple	29	309,857	379,000	.769	2.63	120	173	2,582	2,191	69.3	81.8	117.8	On bottom of tubing.
19	No. 9B—100 pct., ⅜-in. flow nipple	67	241,894	378,000	.770	2.73	116	172	2,121	2,197	67.4	63.9	96.5	On top and bottom of tubing.
5	No. 11—100 pc.., fluid lift	15	356,000	371,000	.734	2.42	62	167	5,762	2,222	37.1	95.9	269.3	Rope-socket fluid-lifter on. 2-in tubing.
12—No. 13—100 pct., 2-in. tub. and packer		7	316,166	368,000	.747	2.57	40	166	7,789	2,216	24.1	85.9	351.4	Bottom of tubing at top of sand.
8	No. 15—2-in. tubing and packer	20	143,625	367,000	.779	2.63	22	164	6,686	2,238	13.4	39.1	298.7	Produced 30% 24 hours.; closed 70%.
7	No. 20—100 pct., fluid lift	18	403,000	369,000	.729	2.34	65	167	6,185	2,209	38.9	109.2	280.1	Swge. nip. perf. tub. type fluid lifter.
	Well "C"—(34A-S.E. 25)—1,827 Deep Deep													
3	No. 1—100 pct. through casing	...	317,000	317,000	.913	4.63	347	347	912	912	100.0	100.0	100.0	
3	No. 3— 50 pct. through casing	...	192,666	316,950	.900	4.24	165	346	1,171	916	47.6	60.8	128.0	
3	No. 4— 30 pct. through casing	...	81,000	316,850	.865	3.60	91	345	891	918	26.3	25.5	97.1	
4	No. 6—100 pct., 11-16 in. flow nipple	44	261,000	316,750	.880	3.75	281	340	929	932	82.4	82.3	99.6	In flow line.
5	No. 5A—50 pct., ¼-in. flow nipple	220	126,000	316,700	.882	3.59	129	338	991	937	38.2	39.7	105.6	In flow line; well flowed steadily.
3	No. 6—30 pct., 3-16 in. flow nipple	201	59,000	316,650	.898	3.49	52	335	1,142	945	15.4	18.6	120.2	In flow line; well flowed steadily.
16	No. 7—100 pct., 2-in. tubing	12	94,812	316,575	1.000	5.80	216	333	444	951	64.5	29.9	46.6	Bottom of tubing at top of sand.
3	No. 8—30 pct., 2-in. tubing	46	26,333	316,450	1.060	5.91	62	331	480	956	18.7	8.3	50.2	Well died in five days.
3	No. 8B	76	30,000	316,400	1.030	5.56	73	329	433	961	22.2	9.5	45.0	Tried for 40% tubing pinch.
10	No. 9—100 pct., 11-16 in. flow nipple	41	280,500	315,700	0.862	1.77	269	311	1,057	1,015	86.5	88.8	104.1	G. P. M. on considerable basis.
13	No. 10—2-in. tubing	22	99,000	316,200	1.030	5.70	266	323	380	978	82.4	31.3	38.8	Open one day; closed next day, etc.
	Well "D"—(31A-S.W. 30)—1,917 Feet Deep													
5	No. 1—100 pct. through casing	72	1,052,000	1,052,000	.880	4.26	1,031	1,031	1,020	1,020	100.0	100.0	100.0	
4	No. 3— 50 pct. through casing	223	515,750	1,050,850	.880	3.34	491	1,018	1,051	1,039	48.2	49.1	101.1	Bottom of tubing at top of sand.
5	No. 4— 30 pct. through casing	264	467,200	1,051,250	.825	2.66	368	1,023	1,273	1,027	35.9	44.4	123.9	
7	No. 5—100 pct., 1-in. flow nipple	106	822,857	1,050,490	.927	3.91	879	1,015	939	1,039	86.6	78.3	90.0	In flow line.
7	No. 5A—50 pct., ½-in. flow nipple	220	516,000	1,050,000	.877	3.90	473	1,011	1,092	1,038	46.7	49.1	105.2	In flow line.
7	No. 6—30 pct., ⅜-in. flow nipple	267	345,428	1,048,400	.868	3.80	355	995	959	1,054	35.6	32.9	90.9	In flow line.
10	No. 6A—30 pct., ¼-in. flow nipple	317	124,000	1,049,500	.863	3.39	143	1,005	878	1,044	14.2	11.8	84.1	In flow line.
12	No. 7—100 pct., 2-in. tubing	76	623,750	1,046,500	.860	1.74	575	972	1,085	1,076	59.1	59.6	100.8	G.P.M. cond. basis bot. tub. top sand.
6	No. 8—30 pct., 2-in. tubing	251	215,333	1,041,000	.859	3.85	153	914	1,426	1,138	16.7	20.7	125.3	Bottom of tubing at top of sand.
	Well "E"—(31A-N.W. 1)—1,907 Feet Deep													
4	No. 1—100 pct. through casing	41	207,250	207,250	.990	4.240	362	362	572	572	100.0	100.0	100.0	
4	No. 3— 50 pct. through casing	121	119,000	207,150	1.060	7.120	241	360	495	575	66.9	57.4	86.0	
4	No. 4— 30 pct. through casing	92	35,250	207,000	1.000	6.39	80	358	443	578	22.3	17.0	76.6	Well flowed steadily.
13	No. 5—100 pct. 11-16 in. flow nipple	42	162,000	206,950	.964	3.78	307	354	527	585	86.7	78.2	90.0	In flow line.
9	No. 5A—50 pct., ⅝-in. flow nipple	99	122,500	206,800	.960	4.45	215	353	577	586	60.9	59.2	98.4	In flow line.
8	No. 6—30 pct., ¼-in. flow nipple	133	54,200	206,650	1.000	5.55	96	350	581	590	27.4	26.2	98.4	In flow line.
12	No. 7—100 pct., 2-in. tubing	16	159,000	206,000	.973	4.97	315	341	506	604	92.3	77.1	83.7	Bottom of tubing at top of sand.
3	No. 8—30 pct., 2-in. tubing pinch	...	89,666	205,900	1.010	....	183	338	482	609	54.1	43.5	79.1	Well died in three days.
8	No. 9—100 pct., 11-16 in. flow nipple	8	157,750	204,970	0.969	4.89	282	322	535	637	87.5	73.5	83.9	On bottom on tubing.
	Well "F"—(36A-N.E. 2)—1,901 Feet Deep													
3	No. 1—100 pct. through casing	32	228,666	228,666	0.931	4.20	378	378	605	605	100.0	100.0	100.0	
2	No. 3— 50 pct. through casing	100	36,500	228,450	0.810	2.13	26	374	1,437	611	6.9	15.9	235.1	Tried for 50 per cent pinch.
2	No. 5—100 pct., ⅝-in. flow nipple	29	224,777	228,360	0.874	3.73	333	372	674	614	89.5	98.4	109.7	In flow line.
9	No. 5A—50 pct., ⅝-in. flow nipple	137	172,333	228,210	0.862	3.39	229	370	738	616	64.5	75.5	119.8	In flow line.
8	No. 6—30 pct., ¼-in. flow nipple	228	108,500	228,100	0.875	3.36	119	366	934	623	32.5	47.5	149.8	In flow line.
6	No. 7—100 pct., 2-in. tubing	25	192,000	227,500	0.991	5.44	324	355	595	641	91.2	84.3	92.8	Bottom of tubing at top of sand.
9	No. 9—100 pct., ¾-in. flow nipple	23	199,555	227,100	0.874	1.84	320	348	626	653	91.9	87.8	95.8	Bot. tub. top sand. G.P.M. Cond. basis
9	No. 10—30 pct., ¼-in. flow nipple	10	170,666	226,575	0.874	4.34	183	337	935	672	54.3	75.3	139.1	On bottom of tubing.
	Well "G"—(6A-S.E. 27)—2,193 Feet Deep													
5	No. 1—100 pct. through casing	11	240,750	240,750	1.070	6.31	480	480	502	502	100.0	100.0	100.0	
4	No. 3— 50 pct. through casing	60	112,250	240,400	1.030	6.60	238	476	473	505	50.0	46.6	93.6	
5	No. 4— 30 pct. through casing	40	44,800	240,100	1.030	6.03	112	472	401	508	23.7	18.6	78.9	
5	No. 5—100 pct., 9-16 in. flow nipple	33	209,400	239,850	0.994	4.26	438	468	478	513	93.5	87.3	93.1	In flow line.
9	No. 5A—50 pct., 7-16 in. flow nipple	54	49,100	238,900	1.030	5.45	171	454	295	526	37.6	20.5	56.1	In flow line.
9	No. 6—30 pct., ⅜-in. flow nipple	75	45,700	239,275	1.010	5.14	146	460	314	520	31.7	19.0	60.3	In flow line.
	Well "H"—(30A-N.E. 27)—2,206 Feet Deep													
3	No. 1—100 pct. through casing	3	116,000	116,000	1.020	6.45	245	245	474	474	100.0	100.0	100.0	
11	No. 13—100 pct., tubing and packer	39	79,545	114,628	0.986	5.76	201	231	414	496	87.0	69.3	83.4	Bottom of tubing at top of sand.

The pipe line station of the Magnolia Petroleum Company at McComb, Oklahoma.

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was employed by the Midwest Refining Co. Throughout the study, characteristic well data were gathered that would be of value in determining the response of a well to pressure control. Although the work was not completed in its entirety, certain conclusions, relating to the whole problem of flowing wells, were reached from the data obtained in the tests.

A more complete study of this problem, with special reference to fields in the Rocky Mountain region, is now being made.

History of Investigation

The production from all wells in the Salt Creek Field between March, 1, 1921, and November 30, 1923, was taken on a prorata basis because there were insufficient pipe line facilities. During the winter of 1921, in order to find out whether a saving of gas would be effected by reducing the flow from the wells, thereby creating back pressure, a group of seven wells was chosen by engineers of the Midwest Refining Co. All of these wells were flowing through casing. At this time all of the wells in the field were being opened wide at different periods in order to determine their 100 per cent capacity. After the open flow of the seven wells was thus established, they were "pinched" to approximately 75, 50 and 30 per cent flow. In each test, every time the individual well was "pinched," the gas efficiency decreased, as shown by an increase in the amount of gas accompanying each barrel of oil. These preliminary tests indicated that the amount of oil could be diminished at will, but there was always an accompanying inefficiency or wastage of gas. All of the above tests were made on second sand wells flowing through 6⅝-inch casing. The wells were controlled entirely by gate valves.

In order to determine whether more oil could be lifted per cubic foot of gas produced, an extensive series of flow tests on different wells was outlined. This gas conservation work was started in August, 1922, and brought to a close in June, 1923. The Midwest Refining Co. was probably one of the first to experiment with pressure control in flowing wells.

Salt Creek Field

The Salt Creek Field is about 46 miles north of Casper, Wyo., and covers an area of approximately 22,000 acres. The geology and descriptions of the field have appeared so frequently in trade journals and scientific publications that no attempt here will be made to repeat this information. Complete data on Salt Creek may be secured from detailed reports by Wegemann[7], and Estabrook and Rader[8].

The major portion of the Salt Creek Field production has come from the second Wall Creek sand at depths ranging from about 1,500 feet on top of the structure to approximately 2,700 feet at the productive limits of the field. The average thickness of this sand is 60 feet. The experiments described in this paper were made entirely on second sand wells varying from 1,800 to 2,200 feet in depth. At the time these experiments were made in 1922 and 1923, the second sand had a closed-in gauge pressure of more than 500 pounds per square inch, and nearly all of the wells drilled to this sand at that time were flowing wells.

[7]Wegemann, C. H. The Salt Creek oil field: United States Geological Survey Bull. 670; 1918.

[8]Estabrook, E. L., and Rader, C. M. History of production of Salt Creek Field: A.I.M.E., "Petroleum Development and Technology in 1925."

Outline of Problem

Briefly, the problems under consideration in studying methods for producing wells are those dealing with flow conditions within the producing sand and within the casing or tubing; also with the expansion and lifting power of gas and the solubility of gas in crude oil. These conditions have been impossible to visualize, necessitating the use of "trial and error" methods.

Usually wells differ in characteristics and behavior, due no doubt to those unseen factors and conditions within the sand itself, and the problem is to determine the physical arrangement that will produce the oil with the least expenditure of gas. The function of a pressure control study is to determine this arrangement through knowledge of the known factors of pressures, fluid levels, amount and gravity of gas, production of oil, and others. The study of wells control is in its infancy and operators and research organizations should continue their efforts to obtain methods of producing that will give maximum efficiency under all conditions.

The tests in the Salt Creek Field were designed primarily to see which of several different methods of producing flowing wells would lift the most oil with the least amount of gas. The experimental work consisted of producing the wells as follows:

1. Through casing with the flow controlled by means of (a) gate valves (b) flow nipples (beans) in the flow line.
2. Through plain tubing.
3. Through tubing with the oil flow controlled by (a) gate valves at the top of the tubing (b) flow nipples at the bottom.
4. By "stop-cocking."
5. By means of flow devices at the bottom of the tubing.
6. Through tubing and packer.

Eight flowing wells producing through casing from the second Wall Creek sand were chosen for the tests. Two of these wells were in the north end and two each in the east, south, and west parts of the field. This group is representa-

(Continued on Page 290)

TABLE 2—CHART COMPARING EACH TEST WITH ESTIMATED OPEN FLOW RESULTS

Well No.	Closed in Pressure	Pressure at Well Head	Specific Gravity of Gas	Gallons per 1,000	Est. Cu. Ft. of Gas per Day Based on Decline	Est. Bbls. of Oil per Day	Est. Cu. Ft. of Gas per Bbl.	Pressure at Well Head	Specific Gravity of Gas	Gallons per 1,000	Cu. Ft. of Gas per Day	Size of Nipple	Bbls. of Oil per Day	Per Cent of Oil Flow	Cu. Ft. of Gas per Bbl.	Per Cent Oil-Gas Ratio	Cu. Ft. of Gas Saved per Bbl. Oil	Cu. Ft. of Gas Wasted per Bbl. Oil	Per Cent Gas Saved per Bbl. Oil	Per Cent Gas Wasted per Bbl. Oil
	Well Wide Open Through Casing							TEST NO. 5 Tried for 75 Per Cent Pinch on Casing									Calculated Results			
"A"	540	29	0.777	3.20	1,140,000	536	2,127	135	.770	3.27	927,666	.....	422	78.7	2,198	103.3	....	71	...	3.3
"B"	500	17	0.796	3.24	383,700	178	2,155	54	.786	3.26	353,333	.....	133	74.4	2,656	123.2	....	501	...	23.2
	Well Wide Open Through Casing							TEST NO. 3 Tried for 50 Per Cent Pinch on Casing												
"E"	495	41	0.990	4.24	207,150	360	575	121	1.060	7.12	119,000	.....	241	66.9	495	86.0	80	....	13.9	....
"G"	200	11	1.070	6.31	240,400	476	505	60	1.030	6.60	112,250	.....	238	50.0	473	93.6	32	....	6.3	....
"A"	540	29	0.777	3.20	1,139,000	533	2,137	255	0.785	3.31	644,000	.....	301	56.4	2,142	100.1	....	5	...	.2
"D"	515	72	0.880	4.26	1,050,850	1,018	1,039	223	0.880	3.34	515,750	.....	491	48.2	1,051	101.1	....	12	...	1.1
"B"	500	17	0.796	3.24	383,400	178	2,154	225	0.790	3.43	245,666	.....	92	51.6	2,661	123.5	....	507	...	23.5
"C"	540	...	0.913	4.63	316,950	346	916	...	0.900	4.24	192,666	.....	165	47.6	1,172	128.0	....	256	...	27.9
"F"	460	32	0.931	4.20	228,450	374	611	100	0.810	2.13	36,500	.....	26	6.9	1,437	235.1	....	826	...	135.1
	Well Wide Open Through Casing							TEST NO. 4 Tried for 30 Per Cent Pinch on Casing												
"E"	495	41	0.990	4.24	207,000	358	578	92	1.000	6.39	35,250	.....	80	22.3	443	76.6	135	....	23.3	....
"G"	200	11	1.070	6.31	240,100	472	508	40	1.030	6.03	44,800	.....	112	23.7	401	78.9	107	....	21.1	....
"C"	540	...	0.913	4.63	316,850	345	918	...	0.865	3.60	81,000	.....	91	26.3	891	97.1	27	....	2.9	....
"A"	540	29	0.777	3.20	1,138,000	531	2,143	420	0.790	3.31	345,000	.....	149	28.1	2,309	107.7	....	166	...	7.7
"B"	500	17	0.796	3.24	383,100	177	2,164	320	0.795	3.36	184,333	.....	71	40.1	2,599	120.1	....	435	...	20.1
"D"	515	72	0.880	4.26	1,051,250	1,023	1,027	264	0.825	2.66	467,200	.....	368	35.9	1,273	123.9	....	246	...	23.9
	Well Wide Open Through Casing							TEST NO. 5—AVERAGE SIZE, 11/16 INCH Intended 100 Per Cent Flow Nipple; Average Flow, 85.9 Per Cent												
"D"	515	72	0.880	4.26	1,050,490	1,015	1,035	106	0.927	3.91	822,857	16/16	879	86.6	936	90.0	103	....	9.9	....
"E"	495	41	0.990	4.24	206,950	354	585	42	0.964	3.78	162,000	11/16	307	86.7	527	90.0	58	....	9.9	....
"G"	200	11	1.070	6.31	239,850	468	513	33	0.994	4.26	209,400	9/16	438	93.5	478	93.1	35	....	6.8	....
"C"	540	...	0.913	4.63	316,750	340	932	44	0.880	3.75	261,000	11/16	281	82.4	929	99.6	3	....	.3	....
"A"	540	29	0.777	3.20	1,135,000	530	2,141	161	0.790	3.03	1,003,333	11/16	454	84.9	2,208	103.1	....	67	...	3.1
"F"	460	32	0.931	4.20	228,360	372	614	29	0.874	3.73	224,777	12/16	333	89.5	674	109.7	....	60	...	9.7
"B"	500	17	0.796	3.24	382,800	177	2,159	136	0.785	3.00	442,333	8/16	153	86.4	2,894	134.0	....	735	...	34.0
	Well Wide Open Through Casing							TEST NO. 5A—AVERAGE SIZE, 6/16-INCH Intended 50 Per Cent Flow Nipple; Average Flow, 48.2 Per Cent												
"G"	200	11	1.070	6.31	238,900	454	526	54	1.030	5.45	49,100	7/16	171	37.6	295	56.1	231	....	39.4	....
"E"	495	41	0.990	4.24	206,800	353	586	99	0.960	4.45	122,500	6/16	215	60.9	577	98.4	9	....	1.5	....
"D"	515	72	0.880	4.26	1,050,000	1,011	1,038	220	0.877	3.90	516,000	8/16	473	46.7	1,092	105.2	....	54	...	5.2
"C"	540	...	0.913	4.63	316,700	338	937	220	0.882	3.69	126,000	4/16	129	38.2	991	105.6	....	54	...	5.7
"A"	540	29	0.777	3.20	1,128,000	519	2,173	339	0.790	3.07	636,000	6/16	260	50.1	2,455	112.9	....	282	...	12.9
"F"	460	32	0.931	4.20	228,210	370	616	137	0.862	3.39	172,333	6/16	239	64.5	738	119.8	....	122	...	19.8
"B"	500	17	0.796	3.24	380,900	175	2,176	234	0.762	2.45	450,000	5/16	88	50.2	5,136	236.0	....	2,960	...	136.0
	Well Wide Open Through Casing							TEST NO. 6—AVERAGE SIZE, 4/16-INCH Intended 30 Per Cent Flow Nipple; Average Flow, 30 Per Cent												
"G"	200	11	1.070	6.31	239,275	460	520	75	1.010	5.14	45,700	6/16	146	31.7	314	60.3	206	....	39.6	....
"D"	515	72	0.880	4.26	1,048,400	995	1,054	267	0.868	3.80	345,428	6/16	355	35.6	959	90.9	95	....	9.0	....
"E"	495	41	0.990	4.24	206,650	350	590	133	1.000	5.55	54,200	4/16	96	27.4	581	98.4	9	....	1.5	....
"A"	540	29	0.777	3.20	1,134,000	529	2,144	420	0.815	3.04	331,333	4/16	148	27.9	2,234	104.1	....	90	...	4.2
"C"	540	...	0.913	4.63	316,650	335	945	201	0.895	3.49	52,000	4/16	52	15.4	1,142	120.2	....	197	...	20.7
"B"	500	17	0.796	3.24	382,000	176	2,170	380	0.809	3.02	124,333	3/16	40	22.8	3,106	143.1	....	936	...	43.1
"F"	460	32	0.931	4.20	228,100	366	623	228	0.875	3.36	108,500	4/16	119	32.5	934	149.8	....	311	...	49.9
	Well Wide Open Through Casing							TEST NO. 7 Two-Inch Tubing Wide Open												
"C"	540	...	0.913	4.63	316,575	333	951	12	1.000	5.80	94,812	.....	216	64.5	444	46.6	507	....	53.3	....
"E"	495	41	0.990	4.24	206,000	341	604	16	0.973	4.97	159,000	.....	316	92.3	504	83.7	98	....	16.2	....
"F"	460	32	0.931	4.20	227,500	355	641	25	0.891	5.44	192,000	.....	324	91.2	595	92.8	46	....	7.1	....
"A"	540	29	0.777	3.20	1,133,000	526	2,152	...	0.783	2.61	917,333	.....	433	82.3	2,114	98.2	38	....	7.3	....
"D"	515	72	0.880	4.26	1,046,500	972	1,076	76	0.860	1.74	623,750	.....	575	59.1	1,085	100.8	....	9	...	.8
"B"	500	17	0.796	3.24	381,700	176	2,167	...	0.753	2.23	581,000	.....	168	95.4	3,459	159.5	....	1,292	...	59.6
	Well Wide Open Through Casing							TEST NO. 8 Two-Inch Tubing Pinched												
"A"	540	29	0.777	3.20	1,131,000	524	2,158	...	1.060	6.50	95,333	.....	137	26.1	716	33.1	1,442	....	66.8	....
"C"	540	...	0.913	4.63	316,150	331	956	46	1.060	5.91	26,333	.....	62	18.7	480	50.2	476	....	49.7	....
"E"	495	41	0.990	4.24	205,900	338	609	...	1.010	...	89,662	.....	183	54.1	482	79.1	127	....	20.8	....
"D"	515	72	0.880	4.26	1,041,000	914	1,138	251	0.859	3.85	215,333	.....	153	16.7	1,426	125.3	....	288	...	25.3
"B"	500	17	0.796	3.24	381,500	176	2,167	...	0.790	2.64	190,000	.....	53	30.1	3,569	164.6	....	1,402	...	64.7
	Well Wide Open Through Casing							TEST NO. 9 Flow Nipple on Bottom of Tubing												
"E"	495	41	0.990	4.24	204,970	322	637	8	0.969	4.89	157,750	11/16	282	87.5	535	83.9	102	....	16.0	....
"F"	460	32	0.931	4.20	227,100	348	653	23	0.874	1.84	199,555	12/16	320	91.9	626	95.8	27	....	4.1	....
"C"	540	...	0.913	4.63	315,700	311	1,015	41	0.862	1.77	280,500	11/16	269	86.5	1,057	104.1	....	42	...	4.1
"A"	540	29	0.777	3.20	1,129,000	521	2,166	...	0.800	3.14	936,000	11/16	413	79.2	2,638	121.7	....	472	...	21.7
"B"	500	17	0.796	3.24	380,000	174	2,181	66	0.753	2.27	448,200	9/16	125	71.8	3,590	164.4	....	1,409	...	64.6
	Well Wide Open Through Casing							TEST NO. 9A Flow Nipple on Bottom of Tubing												
"A"	540	29	0.777	3.20	1,125,000	514	2,188	73	0.833	3.18	546,800	6/16	266	51.7	2,075	94.8	113	....	5.2	....
"B"	500	17	0.796	3.24	379,000	173	2,191	29	0.769	2.63	309,867	5/16	120	69.3	2,582	117.8	....	391	...	17.8
	Well Wide Open Through Casing							TEST NO. 10 One-quarter Inch Flow Nipple on Bottom of Tubing												
"A"	540	29	0.777	3.20	1,122,000	510	2,200	38	0.804	2.77	361,000	4/16	188	36.8	1,947	88.5	253	....	11.5	....
"F"	460	32	0.931	4.20	226,575	337	672	10	0.874	4.34	170,666	4/16	183	54.3	935	139.1	....	263	...	39.1
	Well Wide Open Through Casing							TEST NO. 11 Rope Socket Fluid Lifter on Bottom of Tubing												
"A"	540	29	0.777	3.20	1,087,000	458	2,373	78	0.744	2.65	927,200	.....	228	49.7	4,078	171.8	....	1,705	...	71.8
"B"	500	17	0.796	3.24	371,000	167	2,222	15	0.734	2.42	356,000	.....	62	37.1	5,762	269.3	....	3,540	...	159.3
	Well Wide Open Through Casing							TEST NO. 13 Two-Inch Tubing and Packer Wide Open												
"H"	200	3	1.020	6.45	114,628	231	496	39	0.986	5.75	79,545	.....	201	87.0	414	83.4	82	....	16.5	....
"A"	540	29	0.777	3.20	1,080,000	448	2,410	66	0.768	2.62	690,571	.....	243	54.2	2,838	117.7	....	428	...	17.7
"B"	500	17	0.796	3.24	368,000	166	2,216	7	0.747	2.57	316,166	.....	40	24.1	7,789	351.4	....	5,573	...	251.4
	Well Wide Open Through Casing							TEST NO. 15 Two-Inch Tub. and Pack. Wide Open; Prod. 30%, Closed 70% Time												
"A"	540	29	0.777	3.20	1,075,000	439	2,448	40	0.757	2.72	232,000	.....	87	19.8	2,698	109.8	....	250	...	10.2
"B"	500	17	0.796	3.24	367,000	164	2,238	20	0.779	2.63	143,625	.....	22	13.4	6,686	298.7	....	4,448	...	198.7

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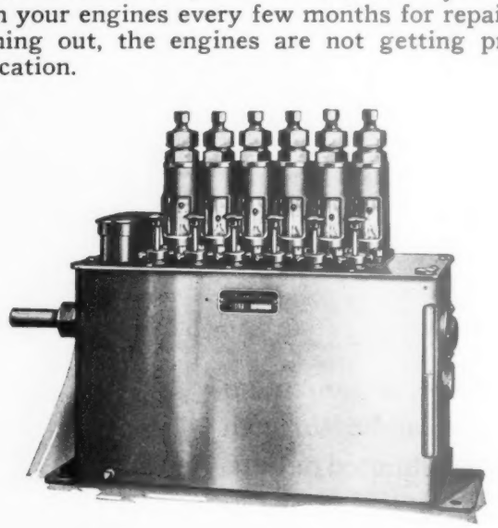

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GULF COAST FIELDS

(Continued from Page 67)

Production Co.'s No. 10-A Marrs-McLean is drilling around 4,720 feet and its No. 9 Daisy Roche around 3,605 feet. This company's No. 6 Jack & Duff is down 4,625 feet. Magnolia Petroleum Co.'s No. 7 fee, also at Spindletop, is drilling around 4,420 feet. Rio Bravo Oil Co.'s No. 2 T. & N. O. is drilling below 2,580 feet. Sun Oil Co.'s No. 16 McLean is drilling around 5,065 feet and No. 17 McLean at 4,980 feet. Sun's No. 6 McLean has pipe stuck at 5,475 feet.

Liberty County

Gulf Production Co. has abandoned its No. 29 Phoenix, Hull Field. This test was dry at 3,848 feet. This was an old well drilled deeper. Empire Gas & Fuel Co. is preparing to put its No. 27 Barngrover at Hull on the pump. Total depth of the hole is around 3,130 feet. Gulf Production Co.'s No. 87 Phoenix is drilling around 4,120 feet. No. 1 Phoenix, being deepened, is down approximately 2,620 feet. Gulf has a rig up for another test at Hull. This will be No. 11 W. T. Thomas fee. Hull Oil Co. has set screen in No. 7 Harrison preparatory to a test of a formation around 3,010 feet. Republic Production Co.'s No. 49 Dolbear is drilling at 2,685 feet, and No. 89, same lease, at 3,760 feet. The Texas Company is setting 12½-inch casing at 1,083 feet in No. 7 Hannah and is drilling deeper. This test is of particular interest as it may mean a southwest extension of the Hull field. It is being drilled jointly by The Texas Company and the Vacuum Oil Co. Navarro Oil Co. is milling casing at 3,200 feet in No. 3 Harrison.

At South Dayton, Humble Oil & Refining Co. is fishing liner and screen in No. 5 Welder, preparatory to working over and deepening the well. Harrison Oil Co.'s No. 1 Jones which opened a new shallow sand production at North Dayton when it was completed pumping 50 bbls. from a sand at 1,609-25 feet, is showing a little water.

Sinclair Oil & Gas Co. is milling on casing in its No. 4 Condit. This is an old well being worked over.

Orange County

Brownie-Babbette Oil Co. is to work over its No. 3 McLean, an old well. Gulf Production Co. also has a rig up to deepen its No. 1 Hager & Moore, and also its No. 2 Lee Hager fee. Gulf Coast Oil Corp. is drilling around 3,200 feet in its No. 5 Leon, an old well being deepened. Humble Oil & Refining Co. is fishing liner in No. 1 Kishi-Lang. This is an old well, originally completed at 3,139 feet, but it will be worked over and deepened. Humble also is to work over and deepen No. 5 Meyers and is fishing liner in this well. Rycade Oil Corp. is drilling around 3,460 feet in No. 13-E State. Sinclair Oil & Gas Co.'s No. 4 Granger is down 3,325 feet where it will be put on the pump. The latter company also has a rig up to work over and deepen its No. 5 Granger. Sun Oil Co. still is working out its No. 2 Brown, which will be deepened.

Washington County

Pratt and associates have a location staked for a test in Washington County. This would be their second Brinkmeyer test. It is in the Brenham district.

Wharton County

Ingram Prospecting Co. is drilling at 260 feet in No. 1 Hounshell, Boling Dome. This is near this company's No. 1 Mensing, which was abandoned several weeks ago at 750 feet. Hyde Production Co. also recently abandoned a shallow test at Boling, No. 7 Banker. The latter tested salt water at 475 feet. Sun Oil Co. has a location staked for No. 4 Farmer.

LOUISIANA GULF COAST

Acadia Parish

Port City Oil Co. has a rig up for No. 8 Jennings-Heywood, Evangeline Field. This company is abandoning its No. 2 S. F. S., this field, but has another test under way, the No. 8 S. F. S. The Texas Company is drilling in No. 106-A Latrielle and No. 2 Rayne heirs, Evangeline Field.

Ascension Parish

At White Castle, Roxana Petroleum Corp.'s No. 1 Wilbert was waiting on mud Saturday. This test is down 330 feet in a gravel formation. The test is in one of the most inaccessible swamp districts of southern Louisiana and drilling of the test has been met with many difficulties. Gulf Refining Co. has abandoned a test in the McElroy Field, Sorrente Dome. This test, No. 3 United Land Co., was drilled to 2,106 feet where it tested dry. This test tried to blow out while drilling at 956 feet but this gas was passed up.

Calcasieu Parish

Of chief interest in the Calcasieu Parish was the abandonment by Gulf Refining Co. of No. 8 Industrial, Starks Dome. This test, drilled jointly by the Gulf Refining Co. and the Standard Oil Co. of Louisiana, was dry at a total depth of 4,769 feet. The only other drilling test on Starks Dome is No. 7 Lutcher-Moore, which at last reports was drilling in sand at 4,809 feet. The former test is on the southwest flank of the dome and the latter on the northern.

At Edgerly, Rex Petroleum Co. has taken over McDaniel & Ellis' No. 1 Ecker and will work it over and drill deeper. This test has been shut down several weeks in salt at 4,000 feet. Rex Petroleum Co. also is rigging up to deepen its No. 6 Hunter, an old test. No. 5 Hunter was brought in several weeks ago as a small gasser. Wilson-Broach's No. 2 Wilson, at Edgerly, is pumping 250 bbls. of oil from a sand at 3,515 feet. It has been pumping for over a week but this is the first report as to its production.

At Lockport, Vacuum Oil Co. and Gulf Refining Co. have a rig up for No. 19 Miller. No. 8 Miller still is shut down at 4,428 feet. The same operators are pulling strainer in their No. 3 Farquahar to drill deeper. The hole now is at a depth of 4,399 feet. No. 3-A Farquahar is down 3,801 feet where casing has been cemented. Resumption of drilling is waiting setting of the cement and some rig repairs. No. 2-A Farquahar still is shut down at 4,437 feet. No. 5 is washing at 4,140 feet with the total depth of the hole at 5,667 feet. These operators have set 6⅝-inch casing at 3,848 feet in No. 4 Bayou D'Inde State. No. 2 Frieber & Wolf is drilling at 5,762 feet. This test encountered a hard sand at 5,746-62 feet but there was no showing of oil.

Cameron Parish

Louisiana Land & Exploration Co. has started drilling in No. 1-A Calcasieu Lake, Big Lake district, and cemented 12½-inch casing at 194 feet.

Iberville Parish

Union Sulphur Co. has a rig up and is starting drilling in No. 1 Wilbert, Atchafalaya district. This company also is starting another test here, No. 1 Schwing.

OIL BURNER CONVENTION

The fifth annual convention and exposition of the American Oil Burner Association will be held at the Hotel Stevens, Chicago, on April 3, 4 and 5, 1928. Owing to the rapid growth of the industry plans are being made to care for an attendance of more than 2,500. A feature of the convention will be a report on the work of the Oil Heating Institute, established a year ago by the association to conduct an educational campaign. The program will include addresses and papers by authorities on oil-burning problems, followed by open forum discussions. An announcement by Leod D. Becker, secretary of the association, says: "Domestic and industrial oil burner manufacturers, dealers and distributors, architects and engineers, service and salesmen, oil company and industrial firm executives are urged to attend."

TO SELL SINCLAIR BUILDING

SHREVEPORT, La., Nov. 26.—The three-story Sinclair Building at Travis and Market Streets, erected in 1919-20 by the Sinclair Oil Co. to house its headquarters here during the Homer-Bull Bayou boom has been withdrawn from the market following failure to get a bid of more than $128,500. It is understood a syndicate is being formed to buy it at private sale.

CANADIAN FIELDS

(Continued from Page 63)

the well a commercial proposition. Stockmen Oils, Ltd., has a No. 2 location in LSD 7, Section 27-20-3w5, on acreage originally held by Henderson Oils, Ltd. Stockmen's No. 2 is on the northwest corner of Section 27, while No. 1 is on the southeast corner. It is possible that drilling may now be started on No. 2, or in the alternative a new location may be made.

British Dominion Oil Corp., LSD 4, Section 5-20-2w5, is at 6,060 feet with 6-inch casing down to 6,011 feet. The string will be run to the bottom of the hole as soon as the weather moderates.

Royalite Oil Co.'s No. 7, LSD 3, Section 13-20-3w5, is being finished in the Madison limestone at 4,208 feet. No definite production figures have yet been made public, though it is understood that the wet gas production at this depth has a potential crude naphtha recovery of 100 bbls. a day or better. The diamond drilling outfit used to finish Royalite No. 7 is being moved back to Dalhousie No. 1, LSD 4, Section 18-20-2w5, which has casing cemented in the top of the Madison limestone at 4,357 feet. Dalhousie No. 1 should get the deep production before the end of December.

Royalite Oil Co.'s No. 8, LSD 9, Section 12-20-3w5, is at 2,493 feet and drilling. Royalite's No. 9, LSD 6, Section 13-20-3w5, is drilling at 1,335 feet. Royalite's No. 10, NE, Section 12-20-3w5, is drilling at 508 feet.

Dalhousie Oil Co.'s No. 5 L.SD, 16, Section 30-19-2w5, which is being deepened to the Madison limestone after getting some light crude production in the Fernie shale horizon, is reported at 4,632 feet and drilling. Dalhousie's No. 6, LSD 10, Section 13-20-3w5, is at 4,517 feet and completing the installation of a rotary outfit for the deeper drilling.

Home Oil Co.'s No. 2, LSD 14, Section 20-19-2w5, which is being completed by Imperial Oil Co., Ltd., is at 3,142 feet and fishing for a lost bit.

In the north end of the Turner Valley, Foothills Oil & Gas Co.'s No. 1, SW, Section 26-20-3w5, is reported at 3,497 feet and fishing.

Royalite Production

Royalite Oil Co. has declared a dividend of 35 cents a share on its 400,000 no par shares, payable December 15 to shareholders of record November 17. This is the third dividend since November 25, 1926, when a dividend of 25 cents a share was paid on the new shares after the splitting up of the old $25 shares into 10 shares each of no par stock was made effective. Another dividend of 40 cents a share was paid June 1, 1927. The Royalite Oil Co. has three wells in active production, Nos. 1, 3 and 4, with a daily crude naphtha recovery of around 569 bbls.; and has from No. 7 well a potential recovery of 100 bbls. a day. The company is understood to have a controlling interest in the Dalhousie Oil Co., and is itself controlled by Imperial Oil, Ltd.; having been originally a reorganization of the Calgary Petroleum Products, Ltd., in which reorganization Imperial Oil, Ltd., had a three-fifths and the Dingman group a two-fifths interest.

Further extension of Imperial Oil, Ltd., activities in the Turner Valley Field is indicated by the announcement that arrangements have been reached for the taking over of the assets of Dolomite Oils, Ltd., by interests believed to represent the Foothills Oil & Gas Co., an Imperial subsidiary operating primarily in the north end of the Turner Valley Field. The Dolomite holdings include a small acreage in LSD 8, Section 1-20-3w5, south of the McLeod wells, and south and west of Royalite's No. 4. It is understood that the consideration includes some cash and a block of Foothills stock.

Great West Oils, SE, Section 7-20-2w5, is reported shut down at 5,370 feet owing to weather conditions. The well has been tied up for several months with a difficult fishing job, some tools having become stuck with cement inside the casing 2,000 feet from the bottom of the hole. Nitric acid has been used to eat away the top of the string so that the jammed tools can be grappled. A new cable is being secured for the fishing job.

McLeod Operations

McLeod Oil Co.'s No. 1, LSD 16, Section 1-20-3w5, is working on a new derrick to replace the one burned a couple of weeks ago. The test is at 3,090 feet and will be carried to the producing horizon in the Madison lime. McLeod's No. 2, same LSD, which has been making around 50 bbls. a day. of crude naphtha from the Madison, got a much better showing in the upper part of that formation, which was later lost owing to drilling difficulties; and it is expected that No. 1 on being deepened will get this larger production.

Spooner Oils' No. 1, LSD 12, Section 13-20-3w5, is drilling around 4,750 feet, being approximately 100 feet in the Madison limestone. Some additional gas was struck in the upper Madison, bringing the wet gas production to approximately 1,000,000 feet a day. The drill is now close to the main producing horizon in the Madison.

Okalta Oils' No. 1, LSD 1, Section 1-20-3w5, is at 4,120 feet and underreaming and running casing to that level.

New McDougall-Segur Oil Co. held its annual meeting at Calgary recently. The company has two wells in LSD 14, Section 12-20-3w5, producing from the Dakota sand horizon, and is getting ready to spud in No. 3 well on the same LSD. The report of the directors stated that No. 3 well will be drilled with a smaller hole than the earlier tests, thus reducing the cost. It was reported that No. 1 well, which started with a flush production of 100 bbls. a day, is making just under 40 bbls. at present; in October it produced 2,171 bbls. of light crude. No. 2, which had a flush production of 110 bbls., has been put on the pump, and indicates a settled production of around 60 bbls. a day. The drilling of both wells was superintended by Pearson & Davies, consulting engineers, of Calgary. One of the chief problems of the company in the past year was bad roads, which hampered drilling operations at No. 2 well, increased the cost of transporting equipment, and on two different occasions tied up No. 1 producer in spite of having 3,000 bbls. storage capacity. In the early stages it cost 52½ cents a barrel to truck the oil from the well to Okotoks and an additional 19 cents a barrel to ship it in tanks cars to Calgary. These difficulties have been partly overcome by building a 2-inch pipe line from the well to Black Diamond bridge, which later may be continued to Okotoks. The company is now selling its production to the Regal Oil & Refining Co. of Calgary, in which it holds $5,000 stock.

The financial report of the New McDougall-Segur Oil Co. showed assets of $1,701.84 in bank, $8,959.93 in government bonds, and accounts receivable amounting to $8,411.84. Oil in storage in the field amounted to 1,197.94 bbls., worth $3,465.04, while there were 392.05 bbls. worth $1,305.52 at Okotoks. The cost of No. 2 well was $79,389.99 and the production from it was $19,606.92, making the net cost $59,783.07. No. 2 well cost $47,260.18. It is expected to finance No. 3 well at lower cost out of current earnings. The statement of production from February 1 to September 30, showed sales of crude oil 11,978.73 bbls. netting $41,487.20; and oil in storage as stated, bringing the total returns from production to $46,257.76. Outlays included wages, board and hauling, $16,274.18; repairs, supplies and fuel, $3,662.85; sundry expenses, $959.98; engineering, $814.34, and depreciation, $1,577.84, a total of $23,289.19; leaving $22,968.57 to carry forward. The company elected the following directors: F. M. Graham, R. J. Hutchings, J. McKinley Cameron, William Pullar, D. J. Young, Dr. L. S. Mackid, John I. McFarland, T. M. Carlyle, and A. G. Spooner

Second Oil Sand

Calmont Oils, LSD 2, Section 1-20-3w5, is at 4,175 feet with casing at 4,149 feet. At this depth the test is reported between 200 and 250 feet in the Blairmore (Dakota) formation and should get the second oil sand in this formation within 200 feet more. The

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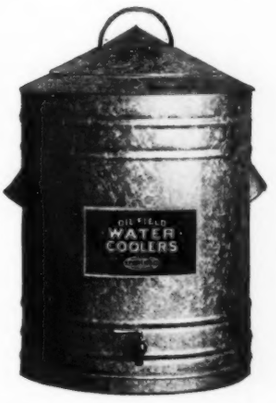

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first sand in the Dakota showed 20 bbls. a day flush production, which was the heaviest showing ever struck in the Turner Valley Field in this horizon; and a correspondingly good showing in the second sand would make the well a commercial proposition without going deeper.

Mayland Oils, LSD 10, Section 17-19-2w5, which spudded in recently, is drilling around 100 feet.

In the Moose Mountain district, Signal Hill Oil Co.'s No. 2, LSD 9, Section 34-23-5w5, is at 1,584 feet and making around 20 feet a day. The test is near the top of the Blairmore (Dakota) sand in which production may be secured. The drillers have been working under difficult weather conditions, with the temperature as low as 20 below zero; but it is planned to continue work through the winter if the well does not get commercial production earlier. A. J. Schwinghamer, of Bruno, Saskatchewan, has been appointed to the Signal Hill directorate, S. J. Fee, of Calgary, is president and S. Sanford Davis is secretary, the drilling being in charge of Fred Beresford, formerly of the Anglo-Persian Oil Co.

Announcement has been made at Toronto of the completion by Imperial Oil, Ltd., of the contracts for development by the Imperial company of the Home Oil Co. properties in the Turner Valley Field. Under this agreement Imperial Oil, Ltd., has taken over the drilling and producing operations on the Home Oil Co. properties, and will pipe the output to the refinery at Calgary. Home Oil Co.'s No. 1, LSD 10, Section 20-19-2w5, has an estimated production of 100 bbls. a day of crude naphtha and light crude oil from the Fernie shale horizon at 4,360 feet; while Home's No. 2, LSD 14, same section, is being completed by the Imperial company with the drill at 3,025 feet.

On the Sinclair structure, in the southern Alberta foothills, Imperial Oil, Ltd.'s No. 1 Highwood, LSD 3, Section 36-18-3w5, is at 3,504 feet with 8¼-inch casing at 3,497 feet.

In the Aldersyde district, south of Calgary, Ranchmen's Gas & Oil Co., LSD 16, Section 13-20-29w4, is at 1,850 feet and drilling.

On the Morley Indian reserve, Gold Coin Oils is shut down at 3,928 feet. Wabash Oils is at 300 feet and changing the drilling outfit.

Pincher Creek

In the Pincher Creek district, near the international boundary, Mount Royal Oil & Gas Co.'s No. 1, LSD 4, Section 7-6-1w5, is at 900 feet and drilling. A first show of gas was encountered at 400 feet and a second at 658 feet; the latter is claimed to be wet gas, and the entire production is reported better than 500,000 feet a day. Hugh MacKay and C. A. Johnson, of Sapulpa, Okla., representing Henry L. Doherty & Co., of New York, are getting ready to drill for the Alberta Oil & Gas Co. on the Doherty acreage in the Pincher Creek area. The location is about 1 mile east of the Jenkins ranch and 6 miles from Waterton. Arrangements have been made for local contractors to set up the camp buildings at once, and over 400 tons of equipment and supplies will be moved in from the nearest rail point at Hillspring. It is understood that two tests will be put down simultaneously, steel derricks being used.

In southeastern Alberta, in the Cypress Hills district, the Eagle Butte Oil Co., LSD 3, Section 31-7-4w4, is reported down 700 feet and running 15½-inch casing. The test recently resumed drilling after a considerable delay due to the difficulty of hauling casing and equipment over the bad roads. Some 2,000 feet of 13-inch casing was recently hauled to the well site.

Near Warner, Gas Production & Transportation, Ltd., NE. Section 21-4-18w4, is reported at 1,600 feet and drilling. A winter camp has been built, and it is planned to continue steady drilling till the test is completed. The test is designed to try out further the possibility of a northward extension into Alberta of the Kevin-Sunburst Field.

In the Gleichen district, southern Alberta, Oil Producers Corp. of Canada, LSD 4, Section 24-22-23w4, has a derrick up and is planning to spud in before December 1.

On Montana Side

On the Montana side, Monalta Oil Co., which got a show of oil in an unsuccessful test near Sweetgrass some months ago, is reported to have located No. 2 on the Pat Buckley Dome 3½ miles west of No. 1. Oil Producers Corp. of Canada is starting a test for Mill City Oils, Ltd., of Calgary, in SW, Section 29-35-3w, 2½ miles west of Kevin. On the Valentine structure in central Montana, the Montana-Major test is reported running 8¼-inch casing. The well is cemented at 1,260 feet and production is looked for around 1,700 to 2,000 feet.

In Saskatchewan, the Rosetown Leaseholding & Development Co. group has its No. 1 Herschell well, LSD 13, Section 4-31-17w3, at 225 feet. Casing is being run and cemented at this depth, after which operations will be shut down till next spring.

Prince Edward Island

In the province of Prince Edward Island, an important deep test carried on for the Henry L. Doherty Co. was recently finished by Hugh MacKay and C. A. Johnson, of Sapulpa, Okla. The test was the second of two tests drilled on Governor's Island, in Charlottetown Harbor, under an extensive concession secured some time ago from the provincial government of Prince Edward Island. No. 1 well had to be abandoned last year owing to drilling difficulties. No. 2 was, however, continued to 5,965 feet, making it the second deepest well in Canada. It failed to secure commercial production, though complete details of the test are not yet available. It is reported that the Doherty interests are abandoning their Prince Edward Island operations and shipping the drilling equipment to Alberta where it will be used in the Pincher Creek district.

In the north end of the Turner Valley, Stockman Oils' No. 1 well, LSD 1-2, Section 27-20-3w5, was wrecked by an explosion on November 22 when the gas flow from the well caught fire. Five men were injured, three of them seriously, and two young children were so badly burned that they are not expected to recover. The injured men were Joe Scuggs, Jom Tehry, Bill Olstaugh, Peter Halderson and Dirgie Olsen; the two children were Billy and Luck Olstaugh. The well, which had been drilled to 4,550 feet, was being brought back to a sand at 1,760 feet where a wet gas flow, estimated at 3,000,000 feet a day, was struck. Following the explosion, the derrick and adjacent buildings caught fire and were completely destroyed.

Production figures from November 1 to 15 indicate that Royalite Oil Co.'s No. 4 naphtha gusher is continuing to increase its production. The production of the Royalite wells for the 15 days aggregated 9,385 bbls. of crude naphtha, being an average of 626.6 bbls. a day. This production came from Royalite Nos. 1, 2, 3, and 4, the greater part of it being from No. 4 gusher, which last month averaged 549 bbls. a day. Royalite No. 7 does not figure in this production, but it is now on the pipe line, and figures of the actual production, which has been estimated up to 100 bbls. a day, will be available shortly.

In the Ontario fields, the Ajax Oil & Gas Co.'s deep test in Dover Township, Kent County, is reported at 1,075 feet and putting in 8¼-inch casing.

In the old Tilbury Field, Union Natural Gas Co.'s No. 276, Radmor farm, Romney Township, is finishing in the Tilbury sand around 1,300 feet. It looks like a small gasser. Union's No. 277, Nick Baldwin farm, Romney Township, is also in the Tilbury sand at approximately the same depth with a small gas production.

In Dawn Township, Lambton County, Union Natural Gas Co.'s No. 19 Mackie farm is at 1,580 feet and drilling.

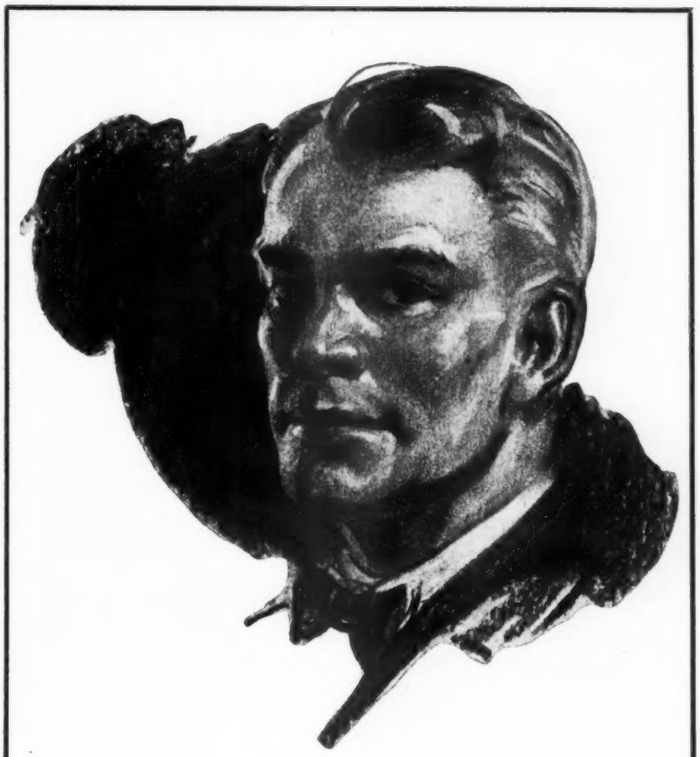
SOUTHWEST WILDCATS

(Continued from Page 65)

located 450 feet to north and 150 feet to east lines, has set surface casing.

Hidalgo County

Queen City Oil & Gas Co.'s No. 1 Ad-



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Operations confined to new areas located in general trends with geological recommendations and financed thru the sale of "spreads" and protection acreage.

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Capital stock $300,000.

Operations confined to proven areas only.

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Holds full 7/16th oil, gas and mineral interest in approximately 17,500 acres of the Hendrick Ranch in Winkler County, Texas — THE WINKLER COUNTY FIELD. These properties are operated by the Southern Crude Oil Purchasing Company on a 50-50 basis.

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FORT WORTH, TEXAS

ams, Lot 1, Block 82, 3 miles north of Mercedes, is fishing at 2,155 feet. D. L. Smith Oil Co.'s No. 5 Fernandez, Porcion 46, Block 34, at 125 feet to north and 225 feet to west line, is shut down at 1,700 feet.

Jim Hogg County

Paesano Oil Syndicate's No. 1 Campbell, Las Vivortias grant, is drilling at 2,410 feet. O. W. Killam's No. 1 Canales, Baluarto grant, is drilling at 2,510 feet. T. G. Shaw's No. 1 Jones, Survey 381, Block 22, located 171 feet to south and 486 feet to west lines (location changed), has spudded in. Holden and others' No. 3 Jones, Share 27, Block 136, is standing at 2,548 feet.

Starr County

Clark & Woodruff's No. 1 Kelsey, Porcion 76, is standing at 200 feet. J. E. Harston's No. 1 Guerra, Survey 43, located 660 feet to south and 1,320 feet to east line, is standing at 300 feet waiting on fuel oil. T. W. Foltz and others' No. 1, Survey 301, located 150 feet to northwest and 2,400 feet to west line, is rigged up.

Bexar County

Allen Burnam's No. 1 Ward, A. A. Gardiner Survey, 1,200 feet to east line and 325 feet to south line, standing at 318 feet.

Atascosa County

Lunberman Oil Co.'s No. 1 Shaw, B. B. B. & C. Survey, Block 331, north central, is drilling at 80 feet.

Bastrop County

Noack & Laning's No. 1 Boemer, Isaac Casner league, 150 feet to northeast corner, is drilling. Fred Adams' No. 1 E. E. Roberts, J. B. Blalock Survey, 1,426 feet to northwest and 150 feet to northeast lines, in top of Edwards at 2,345 feet.

Bee County

D. Hewitt's No. 1 Ray, shut down at 2,247 feet. F. Nichols has derrick up for test 1½ miles south of Normanna. Nichols & White's No. 1 Hicks, Block 19, Hicks-Ball Survey, northwest corner, is standing at 1,408 feet. Red Ant Oil & Gas Co.'s No. 1 Perry & Chesnut, B. Q. Hadley Survey, is drilling below 805 feet.

Caldwell County

Pat M. Armstrong's No. 1 Hardeman, Miles G. Dykes Survey, 150 feet to northwest and southwest lines of farm, is rigging up. Detex Oil Co.'s No. 1 Hardeman, 4 miles north of Luling, is standing at 3,075 feet. Martin & Wright's No. 1 Blackwell is shut down at 26 feet. Ratcliffe's No. 1 New, James Hindes Survey, is standing at 2,914 feet.

DeWitt County

Empire Southern Oil Co.'s No. 2 Smith, Survey 3, located three-fourths mile west of No. 1, is shut down at 3,150 feet. Williams & Gates' No. 1 Gohmert, G. W. Brooks league, 175 feet to north and 300 feet to east lines, is still standing at 760 feet.

Dimmitt County

Humble Oil & Refining Co.'s No. 1 City National Bank, Survey 654, located 700 feet to north and 2,000 feet to east lines, is drilling at 4,278 feet.

Frio County

Lain & Brown's No. 1 Edwards, Hooper & Wade's Survey, 920 feet to center north line, is drilling at 1,040 feet. P. A. Neilan's No. 2 Blackaller, James Gouley Survey, is in top of chalk.

Fayette County

E. A. Bainbridge has derrick up for test in the Lewis & Toy leagues.

Goliad County

Houston Oil Co.'s No. 4 R. L. Pettus, P. Trevino Survey, 1,200 feet southwest of No. 2, is drilling in gumbo at 3,767 feet. C. W. Simpson's No. 1 Ideus, W. H. Pendleton Survey, 156 feet to north line and 540 feet to west line, is making drill stem test at 2,107 feet.

Gonzales County

Green & Shall's No. 1 Dubose, G. McConnell Survey, 1,320 varas to southwest and 450 varas to northwest, is drilling at 1,800 feet. L. L. Jones and others' No. 1 Campbell, Moore & Bridges Survey, at 1,733 feet cored gray sand with some gas. Stern & Gips' No. 2 Ramzinsky, Gonzales Survey, 1,120 feet to north and 725 feet to west line, is drilling. L. P. Unkel's No. 1 Hampton, C. H. Jaeger Survey, is drilling at 920 feet. H. B. West, trustee, No. 2 Preston, W. W. Pace one-third league, R. P. Whitney Survey, is preparing to test at approximately 1,500 feet.

Guadalupe County

Eugene Sights' No. 1 Fred Kruger, Isaac Baker Survey, 450 feet to north and west lines, has set one joint of surface casing in rock and resumed drilling at around 150 feet.

Hays County

J. E. Rodgers' No. 1 Hohenburg, 2½ miles east of San Marcos, is fishing at 2,093 feet.

Kerr County

Walker-Van Duyn's No. 1 Barfield, B. B. Peck Survey, 4,700 feet to north and 450 feet to east lines, near Center Point, is drilling at around 700 feet.

Live Oak County

Delta Oil Co.'s No. 1 McNeil, Jane Curry Survey, is shut down at 1,010 feet. Houston Oil Co.'s No. 20 Cartwright, M. Trudo Survey, has set casing at 2,158 feet; No. 21 Cartwright, J. M. Colchado Survey, has set casing at 1,616 feet. Encino Oil Co.'s No. 1 Stewart, Ezzo McWhorter Survey, 500 feet south of Lagarto Creek and 500 feet west of Nueces River, is waiting on orders at 2,012 feet.

Medina County

Pat M. Armstrong's No. 1 Mangold, Sarvey, 62, located 200 feet to east and south lines of farm, is drilling at around 200 feet. F. Banderet's No. 1 Mofield, Survey 532, at 550 varas to east and 950 varas to north line, at 72 feet had oil showing, but did not test. Chicon Oil Co.'s No. 1 Junman is drilling at about 500 feet.

Maverick County

Ryan Consolidated Petroleum Co.'s No. 1 Indio, Survey 14, center, is drilling at 2,535 feet. Ryeade Oil Corp.'s No. 1 Chittim, Section 129, Block 7, is fishing at 4,295 feet; No. 2 Chittim, Section 158, Block 7, is drilling at 1,700 feet; No. 2 Sullivan is drilling at 5,132 feet.

Milam County

Kent-Middleton Refining Co.'s No. 1 Leslie Boatright, 3 miles east of Cameron, is moving in rig. J. W. Kemp's No. 2 Jacob, J. Leal Survey, one location from No. 1 and 8 miles south of Cameron, is moving in. White Brothers' No. 1 White, L. Taylor Survey, northwest central, is drilling at 800 feet in hard black shale with oil showing at 700 feet. Von Gonton's No. 1 Von Gonton fee, M. J. Delgado Survey, 150 feet to west and 180 feet to south lines, is drilling.

San Patricio County

Houston Oil Co.'s No. 1 Baldwin being completed at 2,148 feet after making 750 pounds rock pressure on drill stem test; No. 1 Humble is ready to drill in; No. 3 Humble, Roos Survey, Block 7, 200 feet to north and 250 feet to east lines, has derrick up; No. 4 Humble, same survey and Block 19, at 1,858 feet to west and 167 feet to south line, is rigging up; No. 5 Humble, same block and survey, is location 167 feet to south and west lines; No. 2 Ragsdale, J. N. Seguin Survey, 575 feet west of No. 1, is rigging up; No. 2 Ragsdale, same survey, is location 1,200 feet north of No. 1. Ed R. Herwick's No. 1 Tsesmelis is drilling. Mission Drilling Co.'s No. 1 Harwood is drilling in gumbo at 2,736 feet; No. 1 Hunter is rigging up; No. 3 Cage is location. National Oil Co.'s No. 1 Sullivan, J.C. McMullen Survey, 500 feet to southwest corner, is shut down at 1,138 feet. George Pickett's No. 1 Garrett is shut down at 3,030 feet; No. 1 Whitworth, Section 60, Colman Fulton Pastore Co. Survey, is drilling at 244 feet and has set surface casing. Saxet Oil Co.'s No. 1 White Point Development, is location; No. 9 Dunn is location; No. 1 Henry is location; No. 12 Rachal is drilling in at 2,312-16 feet; No. 9 Rachel is drilling at 1,450 feet; No. 1 Hunter is location; No. 7 Dunn is' location. John Sigmund's No. 9 Robinson set and cemented casing and will test at 1,600 feet.

Travis County

Roy Clark and others' No. 1 Carl Jacobson, C. Harrison, 500 feet to east line of farm, is drilling at 450 feet.

Val Verde County

Crusoe Williams' No. 1 Holman, Section 5, Block N, is shut down at 2,940 feet for casing. East Del Rio Oil Co.'s No. 1 Sellers, Section 183, is shut down at 3,210 feet in brown lime. Independent Operator's No. 1 Whitehead, SE SE Sec-

tion 30, Block 4, is shut down at 3,925 feet. Magnolia Petroleum Co.'s No. 1 Whitehead, Survey 81, is drilling at 5,140 feet in shale and lime. O. O. Owens and others' No. 1 Mills, Section 128, Block 1, is drilling at 3,198 feet with increase in gas. W. V. Traves' No. 1 Wilson, Section 115, Block E, is rigging up.

Uvalde County

Pure Oil Co.'s No. 1 J. D. Smythe, Survey 687, located 740 feet to north and 146 feet to east of southeast corner of Survey 20, is drilling at 90 feet.

Victoria County

J. J. Elam's No. 1 Vol Kutchka, 200 feet CNL of Section 40, is moving in machinery to spud in. Humble Oil & Refining Co.'s No. 1 Welder is drilling in rock at 214 feet. R. M. Talbott's No. 1 Reeves is shut down at 1,825 feet.

Zavala County

J. G. Pundt's No. 1 West, Fuentes Survey, northwest corner, is drilling at 1,100 feet. Western Gas & Fuel Co.'s No. 1 West is drilling at 400 feet.

LA.-ARK. WILDCATS

(Continued from Page 69)

No. 1 Bowman-Hicks Lumber Co. in Section 14-7-14, Sabine Parish, for nearly two years and on November 24 brought it to a test at 3,529 feet. Bailed down around 2,600 feet it showed a little oil. Bailed to the bottom it showed the same amount of oil and salt water and is shut down waiting orders.

McDonald's test of No. 1 Pelt, Section 9-15-22, about 12 miles southwest of production in the Irma district of Nevada County, developed a little dead oil and after standing several hours a very small quantity of live oil appeared. Total depth is 1,997 feet with the bottom 15 feet in broken sand and shale. Cable tool core barrel is being run and if the samples make it worth while the hole will probably be deepened a few feet for another test. This failing, it is possible that the wildcat will go on down around 2,450 feet.

Pitcher and others, drilling a rank wildcat in Section 21-17-11, Union County, Arkansas, 20 miles east of nearest production in the El Dorado East Field, meanwhile have gone to the opposite extreme in the western end of the county and made location 2 miles east of Stephens production for No. 1 Kinard in Section 17-15-19.

Coming back to Richland Parish again, Roxana Petroleum Corp. may have the makings of an extension of proven territory to the southwest that will make the Woodley & Collins-Triangle extension seem small by comparison. Its No. 2 Tensas Delta Land Co. in Section 1-14-5e, is said to have made a show of gas sufficient to warrant setting 6¼-inch casing at 2,398 feet for a test of a streak of potential pay from around 2,400-21 feet. Should the wildcat pay off it would be an extension of approximately 8 miles southwest or, possibly like the Woodley-Triangle well, prove a new structure.

Approximately 50 miles east of production in Richland is an abandoned wildcat started some time ago by Bannon and others in Section 51-16-14, Madison Parish. Recent happenings in Richland have caused W. S. Smith to take over this old hole, abandoned at 1,690 feet, and surrounding acreage, and he is rigging up to drill it deeper. Location is not far from the Mississippi River and southeast of Talluluh.

Including the Woodley-Triangle extension, there were three wildcat completions in this territory during the week. Frazier and others abandoned No. 1 Harris in Section 29-10-12, Sabine Parish, a mile northwest of Pleasant Hill production, at 3,290 feet. Tested at that depth three weeks ago, it made 500,000 feet of gas with a spray of salt water after 6-inch casing had been cemented at 3,140 feet for a test following a blowout of an estimated 2,000,000 feet of gas. The other wildcat was a small pumper on the southern fringe of Smackover production in Union County, Arkansas, and north of the heavy oil Jim Stocks produced on the north fringe of the El Dorado discovery pool not many weeks after the Busey well blew in. This well, W. R. Keever's No. 3 Ezell, in Section 12-17-15, stood 600 feet in fluid from 5 feet of sand at 2,131-36 feet for three weeks and when standardized last week it pumped 100 bbls. of fluid, 70 per cent salt water. He has two more wells under way in the same section.

NORTH LOUISIANA

Bienville Parish

Louisiana Petroleum Co., drilling No. 1 Hays, Section 18-16-5, has a fishing job, trying to get hold of lost drill stem, total depth 2,326 feet.

Bossier Parish

Doern and others' No. 1 Bollinger, Section 9-22-11, shut down last week at 2,830 feet waiting orders, has resumed drilling and is down 2,980 feet. H. S. Goodwin's No. 1 Curtis, Section 2-16-13, set 6⅝-inch casing with packer at 2,397 feet and tested salt water at 2,504 feet. Walker and others have shut down at 2,420 feet on No. 1 Antrim, Section 28-22-13.

Caddo Parish

Greenwood Production Co. began drilling No. 1 Cooper & Ellerbe, Section 15-18-14, November 18 and have set 12½-inch casing at 139 feet. Ohio Oil Co.'s No. 1 Thompson, Section 32-23-16, west of Rodessa in the northwest corner of the parish, is drilling at 2,623 feet. In the same section No. 1 Aaron B. Land Co. is temporarily abandoned at 1,553 feet, and No. 1 E. Plum is temporarily abandoned at 1,619 feet. Tubbs and others' No. 1 Ben Hines, Section 9-14-16, is in lime at 2,004 feet. Woodley Petroleum Co.'s No. 4-B Knight in Section 2-15-12, is drilling at 2,310 feet.

Catahoula Parish

S. D. Hunter's No. 1 Tensas Delta, Section 21-9-7, is drilling at 2,484 feet. Lochnager Oil & Gas Co. plugged No. 2 Beasley, Section 26-9-6, back from 3,141 feet to 3,098 feet and whipstocked 6-inch casing, drilled to 3,318 feet and now is arranging to replug; their No. 1 McMillan in Section 29-9-6, cemented 8¼-inch at 1,621 feet and tested dry with no show of oil or gas at 1,637 feet. Standard Oil Co.'s No. 1 Tensas Delta, Section 23-8-5, is arranging to core a sand picked up at 1,414 feet.

Claiborne Parish

Magnolia Petroleum Co. is drilling lime and shale at 4,377 feet in No. 1 C. C. Lee, Section 16-22-8.

DeSoto Parish

Going after gas with the idea of supplying fuel to Pleasant Hill operators and having an old well which blew out with oil and gas several years ago and burned for several days as an indicator, Benson Oil Co. is drilling No. 1 Woolf, Section 3-10-13, at 2,200 feet. In the Logansport district, Carlton Drilling Co. made location, got derrick up and rigged and set 10-inch surface string at 210 feet in No. 1 Stevens, Section 12-11-16, before the wildcat got on the report.

Franklin Parish

Louisiana Petroleum Co.'s No. 1 Tensas, Section 11-11-6, is drilling at 1,100 feet and Pittsburgh Exploration Co.'s No. 3 Moore in Section 12-11-6, is coring at 2,000 feet.

Madison Parish

W. S. Smith has taken over No. 1 Yerger in Section 51-16-14 formerly carried as Bannon and others, and surrounding acreage, and is rigging up to drill deeper as a result of the Richland Parish gas development. Bannon and others abandoned the wildcat at 1,690 feet, leaving casing in the hole.

Natchitoches Parish

Lawson & Pharis, who have drilled three or four unsuccessful tests in Natchitoches Parish, have made a new location for No. 1 Dave Delrie 408 feet east and 462 feet south of NW cor. NW Section 18-5-5, begun drilling and set two joints of 10-inch casing at 40 feet as surface string.

Rapides Parish

Collins Brothers, who began drilling No. 1 Allen, Section 25-5-1w, a townsite well in Tioga November 14, set 10-inch surface casing at 87 feet and are drilling at 450 feet.

Sabine Parish

S. P. Borden and others, drilling No. 1 Logan in Section 36-10-13, 2 miles west

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To raise a string of rods 40 feet with three working lines requires only 120 feet wound on the drum. When four working lines are used, the Rock Island Model 70 Winch still has sufficient capacity to handle without piling up.

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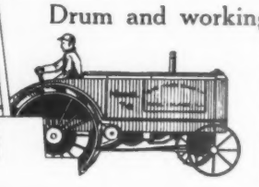
It will pull the rods and tubing in any oil well — pull them slowly — stop at any point desired and then go on. It is equipped with roller bearing friction clutch. Speed can be increased as load decreases.



Drum and working lines are inside derrick — operator and control mechanism outside — complete safety for operator.

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Rock Island Plow Co.

ROCK ISLAND, ILLINOIS

of Pleasant Hill production, are down 1,250 feet. Dixie Oil Co., whose entry into Sabine territory last week attracted considerable attention, shut down No. 1 Steinfelt in Section 20-1-12 at 80 feet two days after they started drilling. L. M. Emlet's No. 7 Bowman-Hicks in Section 14-7-14, attracted more or less of a gallery to watch a test at 3,529 feet and is shut down since the test developed a small show of oil and salt water; his Mansfield Hardwood Lumber Co.'s No. 1 in Section 15-7-14, is rigging up on a second hole, the first being lost at 515 feet.

Webster Parish

S. A. Lane is drilling No. 1 Miles, Section 24-17-9, at 1,050 feet.

West Carroll Parish

The Palmer Corp. cemented 8-inch casing at 932 feet in No. 1 White, Section 2-19-10, and is drilling at 1,907 feet. Phillips Petroleum Co. is drilling No. 1 Marion, Section 32-20-9, at 2,920 feet.

Winn Parish

Ohio Oil Co. has shut down No. 1 Edenborn, Section 31-10-4w, at 2,400 feet, and is drilling No. 2 Rolan, Account 1, Section 5-12-1w, at 2,831 feet. H. M. Roark and others hit the top of the rock salt at 490 feet in No. 3 Southern Minerals Co., Section 19-11-3w, and are shut down at 515 feet. No. 2 on the same lease was abandoned at 1,000 feet, several hundred feet in salt, and No. 1, also in the same section, hit the salt at 412 feet and was abandoned in the same formation at 800 feet.

ARKANSAS

Nevada County

McDonald and others are bailing to test 15 feet of broken sand and shale, total depth 1,997 feet, in No. 1 Pelt, Section 9-15-22, about 10 miles southwest of production in the proven Irma district.

Ouachita County

A. T. Grayson tested dry after a show of oil and gas at 1,756 feet in No. 1 Reynolds, Section 21-14-17, and is waiting orders. H. M. Harrell's No. 1 Ponder, Section 18-12-17, began drilling November 11, set 10-inch at 105 feet and is trying to kill an artesian flow at 1,066 feet. Magnolia Petroleum Co.'s No. 1 Stout Lumber Co., Section 26-14-16, is drilling at 3,075 feet. Booth and others are drilling No. 1 Rowland, Section 8-17-11, at 2,715 feet. W. R. Keever bailed dry after a show of oil and gas at 2,156 feet in No. 4 Ezell, Section 12-17-15, and will drill deeper. Lion Oil & Refining Co. began drilling No. 1 Horn, Section 17-17-13, November 21. Pitcher and others' No. 1 Arkansas Timber Co., Section 21-17-11, is drilling at 1,178 feet and they have gone into the opposite (western) end of the county and made location for No. 1 Kinard in SE cor. SW NE Section 17-15-19. Derrick is up and will probably be rigged during the next week or 10 days.

Calhoun County

Genther and others' No. 1 Stout Lumber Co., Section 3-14-16, is drilling at 2,815 feet.

Columbia County

The Texas Company shut down at 2,472 feet on No. 1 Alexander, Section 8-17-19, for the last two weeks, has decided to go on deeper and is drilling at 2,775 feet.

Garland County

Chawood Oil Co. bailed dry at 1,670 feet in No. 1 Malvern Lumber Co., Section 17-2-17, and will go deeper. H. H. Givan's No. 1 Garrett, Section 1-3-19, is shut down at 3,025 feet waiting for new tools of different design to resume fishing for lost cable tools.

EAST TEXAS

Panola County

Bethany Oil & Gas Co. has made location 2,100 feet east and 700 north SW cor. W. A. Birdsong Survey for No. 3 Burns and for No. 4 on the same lease 3,700 feet east and 700 feet north of the SW cor. of same survey; No. 3 Richardson, Joseph Story Survey, is down 700 feet. Magnolia Petroleum Co. is testing No. 2 Sarah Davenport, Jessie Dunlap Survey, at 2,390 feet and drilling No. 1 Lila Fletcher on the B. C. Jordan Survey at 2,025 feet; No. 2 Jehu Jernigan, Jane Thorpe Survey, is rigging up and No. 12 C. G. Steele on the same survey, is drilling at 938 feet; No. 1 J. M. Trosper, James Shadoin Survey, is drilling at 2,090 feet after cementing at 1,987 feet to cut off a salt water flow.

Harrison County

Doney and others' No. 1 Furrh, on the Joel Lipscomb Survey, is drilling at 300 feet. Magnolia Petroleum Co.'s No. 1 Will Anderson, J. Womack Survey, is waiting on standard rig, total depth 2,402 feet. State Line Oil & Gas Co. is drilling No. 2 Mullins, T. D. Wilson Survey, at 120 feet and No. 5 C. M. Abney estate, E. Little headright, is in sand at 2,640 feet. A. L. Waller hade a test in the shallow pay on No. 2 J. M. Bryson, W. R. Anderson Survey, and is drilling at 1,200 feet.

Sabine Parish

Crater Oil Co. has given up trying to fish drill stem lost in No. 1 American Lumber Co. on the R. B. Anthony Survey, and is sidetracking, total depth 3,294 feet.

Shelby County

Magnolia Petroleum Co. is drilling hard lime in No. 1 Pickering Lumber Co., W. J. Crane Survey, at 3,105 feet.

ROCKY MOUNTAIN AREA

(Continued from Page 240)

down the volume of fluid. The rods are being pulled to clean and to change the system. B. O. Jones and others, who are to drill a flank test on this structure with the Utah Southern Oil Co., have made a location on the John L. Shafer No. 1 permit, 1,241 feet west and 200 feet south of the northeast corner of the permit, in the NE Section 36-26-20, a mile north and a little west of the Frank Shafer well. It is 450 feet down the structure which the operators consider sufficiently low to test the theory that these structures are salt domes and may be productive on the flanks. Oil from the Frank Shafer well will be used for fuel and plans are to get the operation under way as soon as possible.

Midwest Exploration Co.'s No. 1 Early, Section 13-4-6, Duchesne County, is cleaning out, the bailer having been lost in the hole. Midwest Refining Co.'s No. 3 Ashley Creek, Section 23-5-22, Uinta County, found water in the Lakota at 1,200 feet. This is a test to the Sundance, No. 1 having had a big flow of gas in the Morrison, but quit before reaching the underlying Sundance which has since been found productive in Colorado. Embar Oil Co.'s No. 1 Big Six, Section 34-25-21, Moab Dome, is drilling at 4,730 feet in limey shale. Texas Production Co.'s No. 1 Shipley, Section 5-27-14, Sweetwater anticline, has finished water well and is preparing to resume drilling at 1,865 feet. Utah Southern Oil Co.'s No. 1 Canyon, Section 18-41-19, East Dome, San Juan County, is now making new hole at 1,350 feet with diamond drill. Mid-American Oil Co.'s No. 1, Section 17-41-15, on the Bloomington Dome in Washington County, in the southwestern part of the state, is drilling below 900 feet. This is intended as a deep test. It was started with a rotary, but the extremely hard Kaibab lime proved too difficult, and a switch to cable tools was made.

Montana

Montana's oil production for 1927 will be somewhat under the figures for 1926. From what the State has produced so far, it would appear that the total production for 1927 will run about 4,987,500 bbls. with a value of $6,683,000 as against a production valued at $10,000,000 for 1926. The 1927 production will only be about $200,000 more than in 1925.

The production of the entire State is now about 13,700 bbls. daily and the Sunburst Field easily leads all others by more than 4,000,000 bbls. for the year.

Great Falls Line

The Sunburst Great Falls gas line is rushing work in spite of the bad weather. A chinook swept across northern Montana a few days ago and cleared away much of the snow but the pipe line workers had bad weather conditions

(Continued on Page 273)

KANSAS FIELDS

(Continued from Page 60)

Lot 26s, Lamont Townsite, Section 30-22-13, was shot with 160 quarts and made 260 bbls. from sand at 1,685-1,736 feet, total depth 1,743 feet. Jennings and others' No. 1 Hollis, NW cor. SW Section 5-23-12, is dry and abandoned at 2,415 feet. Simmons & Rhodes' No. 1 Bowles, SE cor. NW Section 15-24-13, is a dry hole at 1,662 feet. Empire Oil & Refining Co.'s No. 1 Roglin, NW cor. NE Section 15-25-13, made 10 bbls. after a shot of 10 quarts in sand at 1,426-35 feet. Flintridge Petroleum Co.'s No. 4 Weirshing, C SW SW Section 23-26-9, is dry and abandoned at 865 feet.

Jefferson County

Wichita Oil Co. has built the rig for No. 1 Simpson, NW cor. SW SW Section 19-10-17.

McPherson County

The Texas Co. is erecting the rig for No. 2 Chinberg, NW cor. NE NW, Section 32-18-2w. Tatlock and others' rig is up for No. 1 Chinberg, NE cor. NW NW Section 32-18-2w.

Morris County

Fisher & Lauck made location for No. 1 Strant, NW cor. SE, Section 6-16-5.

Russell County

Day and others' No. 1 Mermis, NW cor SE NE, Section 32-13-15w, is spudding.

Shawnee County

McBride & Goens' No. 1 Shirley, NE cor. SW, Section 21-12-14, is drilling at 1,630 feet.

Sumner County

Champlin Oil & Refining Co. is building the rig for No. 3 Latta "B," SW cor. NW, Section 9-30-2w. De Frest Drilling Co. moved a machine to the location for No. 1 Bryan, SW cor. Section 25-30-2w. Vickers Petroleum Co. made location for No. 4 Shore, NE cor. SE, Section 24-31-2e. Roxana Petroleum Corp. and Washoma Oil Co. built the rig for No. 2 Jenkins, NE cor. SE, Section 26-31-2e. Roxana Petroleum Corp. has the rig up for No. 4 Emerich, Tract 5, Oxford Townsite Pool, Section 14-32-2e. Wasson and others' No. 1 Glassoway, NE cor. SE SW, Section 14-32-2e, was completed for 200 bbls. in sand at 1,180-1,281 feet.

OKLAHOMA FIELDS

(Continued from Page 60)

moved a machine out for No. 8 Sanders, NW cor. SE SW, Section 34-15-18. E. A. Hutchinson and others' machine is at the location for No. 1 Cherry, SW cor. NE NW, Section 27-14-16. Becker & Shaffer's No. 1 Kelley, SW cor. SE NE Section 5-14-19, is drilling at 570 feet. W. R. Sommerville has the rig on the ground for No. 2 Carver, NE cor. SE, Section 4-13-19.

J. G. Buell's No. 1-A Manuel, SW cor. NE SW, Section 34-15-18, is making 2,000,000 feet of gas from the Wilcox sand at 1,799-1,824 feet.

McIntosh County

J. E. Weible's No. 1 S. Bruner, SW cor. SE NW, Section 36-11-16, is a dry hole at 1,739 feet.

Okfuskee County

Sheldon Oil Co. and others' rig is up for No. 1 Jacobs, NE cor. NW NW Section 22-12-11. The Texas Company's No. 2 Tiger, SE cor. NE SE Section 35-11-11, an old well, is drilling deeper at 2,900 feet. Phillips Petroleum Co. and others made location for No. 1 Tecumseh, NW cor. NE NW, Section 21-10-9.

Osage County

Duffield and others made location for No. 1, NW cor. NE Section 27-21-12. The Prairie Oil & Gas Co. made location for No. 14 NW cor. NE SE Section 21-25-8. The rig is being built for No. 6, NE cor. SE NE Section 20-27-6, Burbank Pool. Location has been made for No. 7, SE cor. NE Section 20-27-6.

Winona Oil Co.'s No. 2, NE cor. NW NE NE Section 18-29-11, was completed for 8 bbls. in the Peru sand at 1,005-40 feet. Kewanee Oil & Gas Co.'s No. 1, NE cor. SW NW Section 26-29-11, is dry and abandoned in the Wilcox sand at 2,045-60 feet, total depth 2,158 feet. The Prairie Oil & Gas Co.'s No. 3, NE cor. Section 20-27-6, Burbank Pool, made 4,500 bbls. from the Burbank sand at 2,897-2,953 feet. Indian Territory Illuminating Oil Co.'s No. 386, NW cor. NE NW, Section 17-27-11, has been shut in for 2,250,000 feet of gas in sand at 700-16 feet. No. 382, SW cor. SE, Section 34-27-11, is making 4,000,000 feet of gas from the Mississippi lime at 1,801-1,850 feet. No. 51, CEL NW Section 25-26-11, drilled deeper from 1,800 feet and is dry and abandoned at 2,075 feet in Wilcox sand. No. 378, NW cor. SE NE, Section 29-26-11, topped the Wilcox sand at 1,943 feet, drilled to 1,946 feet and was abandoned.

Marland Oil Co.'s No. 3, NE cor. SE, Section 27-25-9, was shot with 280 quarts in the Bartlesville sand at 2,135-94 feet and made 100 bbls. No. 375, NE cor. SE SW NW Section 10-25-10, came as a 10,000,00-foot gas well in the Wilcox sand at 2,279-85 feet. Verland Oil Co.'s No. 8, NE cor. SW NE Section 17-21-12, was completed for 10 bbls. in Bartlesville sand at 1,358-90 feet. Elliott & Smith's No. 13, NW cor. SE SW, Section 20-21-12, made 10 bbls. from the Bartlesville sand at 1,598-1,656 feet.

Okmulgee County

Amerada Petroleum Corp. and others' rig is up for No. 1 Farmer, SW cor. SE, Section 7-14-11. W. B. Pine's No. 3 Skidmore, C SE NW Section 10-15-14, is rigging up. Cassellman & Young's No. 1 Lewis, NE cor. NW NE, Section 36-15-14, is spudding. B. Sheppard and others' No. 1 Burgess, NW cor. NE NW Section 20-12-13, is rigging up. B. Morgan's No. 1 G. Fisher, NE cor. NW, Section 13-11-13, is an old well drilling deeper at 2,240 feet.

G. Colvin's No. 2 Phillips, SW cor. NW SE, Section 19-13-11, made 12 bbls. after a shot of 20 quarts in the Dutcher sand at 2,657-67 feet.

Pittsburg County

Quinton Spelter Co.'s No. 1 Featherstone, SW cor. NW NW Section 21-7-17, is drilling at 1,900 feet.

Payne County

Gardner Petroleum Co. is building the rig for No. 1 Ham, C SW NE, Section 33-19-1.

Pontotoc County

Snowden & McSweeney's No. 1 Gilmore, SE cor. NE SW Section 15-5-8, an old well being deepened, is underreaming 6⅝-inch casing at 2,665 feet. Louisiana Oil Refining Co.'s No. 6 McElroy, NE cor. NW SE Section 17-5-8, Allen Pool, is rigging up rotary tools.

W. R. Ramsey's No. 2 Milner, NE cor. NW SW Section 17-5-8, Allen Pool, made 115 bbls. from sand at 2,338-95 feet. Louisiana Oil Refining Co.'s No. 5 Perry, SW cor. SE NW Section 20-5-8, was completed for 410 bbls. in sand at 2,481-2,566 feet. American Oil Refining Co.'s No. 6 Balcrop, CSL SE SE Section 8-4-6, has been completed for 8,000,000 feet of gas in sand at 1,300-20 feet.

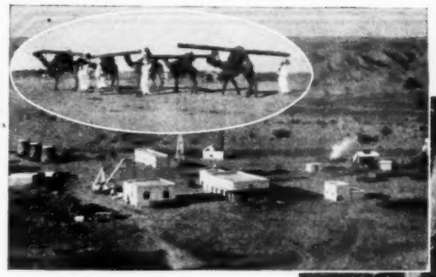
Pottawatomie County

Independent, Darby and Gypsy's rig is being erected for No. 2 Hamby, NW cor. Section 14-7-4, Pearson area. Magnolia Petroleum Co. is building the rig for No. 1 Singletary, SW cor. NE SW Section 14-7-4. Independent Oil & Gas Co. has the rig up for No. 1 Light, SW cor. SE Section 18-7-4. Gypsy Oil Co.'s No. 1 Cecil, SW cor. NE, Section 19-7-4, is setting surface pipe. Magnolia Petroleum Co. made location for No. 1 Singletary, SE cor. NE NW, Section 23-7-4.

Magnolia Petroleum Co.'s No. 5 Cowden, SE cor. NW SW, Section 4-9-5, Earlsboro Pool, went into the Wilcox sand at 4,365 feet, drilled to 4,370 feet and pumped 32 bbls. Tidal Oil Co.'s No. 7 Watkins, NE cor. NW NW Section 9-9-5, swabbed 300 bbls. from the Wilcox sand at 4,358-71 feet. Independent Oil & Gas Co.'s No. 1 Harber, NE cor. Section 32-9-5, is dry and abandoned at 4,853 feet. Sinclair Oil & Gas Co.'s No. 1 Bowers, NW cor. SE, Section 7-7-5, topped the Wilcox sand at 4,560 feet, drilled to 4,571 feet and was abandoned.

Seminole County

Carter Oil Co.'s No. 2 S. Davis, NE cor. SW NW, Section 13-9-5, Earlsboro Pool, is rigging up rotary tools. The Prairie Oil & Gas Co. is moving the rig



At left, Sullivan Diamond Drill in Punjab, India.

Below: Sullivan Diamond Drills exploring for petroleum in British North Borneo.

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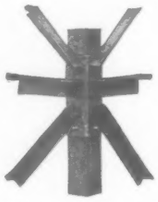

Outside joint of an O'Brien Derrick. The slot formed by the two plates holds the legs in place, while bolting up, thus making fast erection easy.

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in for No. 5 C. Davis, SE cor. NW NW Section 13-9-5. Barnsdall Oil Co.'s No. 5 Sango, SE cor. SW NW Section 1-9-5, is rigging up rotary tools. McCulloch Oil Co. has the rig up for No. 1 Coody, SE cor. SW SE Section 18-9-7. The Texas Company built the rig for No. 1 Brinsfield, NE cor. NW Section 10-9-8. Carter Oil Co.'s No. 1 R. Smith, SW cor. Section 7-8-7, is rigging up rotary tools. Sands Petroleum Co. and others made location for No. 1 Perkins, SE cor. NE Section 31-8-7.

Shaffer Oil & Refining Co.'s No. 5 Clark, SE cor. SW SE, Section 1-9-5, Earlsboro Pool, was completed for 791 bbls. in Wilcox sand at 4,388-90 feet. The Texas Co.'s No. 2 Anderson, SE cor. Section 2-9-5, had Wilcox sand at 4,282-87 feet and swabbed 830 bbls. after a shot of 15 quarts. No. 6 Anderson, SE cor. NW SE Section 2-9-5, was shot with 15 quarts in the Wilcox sand at 4,529-33 feet and made 150 bbls. on the swab. Twin State Oil Co.'s No. 2 Hearn, SW cor. NE SE Section 2-9-5, had an initial production of 4,625 bbls. from Wilcox sand at 4,383-92 feet after a shot of 10 quarts.

The Texas Company's No. 8 Wilmott, SW cor. NE SE Section 10-9-5, made 1,735 bbls. after the Wilcox sand at 4,367-91 feet was shout with 15 quarts. Barnsdall Oil Co.'s No. 3 D. Davis, NE cor. NW SE Section 11-9-5, made 200 bbls. from Wilcox sand at 4,472-91 feet. Magnolia Petroleum Co.'s No. 2 Holmsley, NW cor. NE SE Section 11-9-5, swabbed 15 bbls. from Wilcox sand at 4,340-59 feet after a shot of 10 quarts. Empire Gas & Fuel Co.'s No. 2 Barker, NW cor. SE NE Section 12-9-5, had an initial production of 3,617 bbls. from Wilcox sand at 4,224-41 feet after being shot with 20 quarts.

Smith and others' No. 1 Townsite, SE cor. NW NW Section 27-9-6, Seminole Pool, is dry and abandoned at 4,225 feet. Pure Oil Co.'s No. 2 Strothers "F," SW cor. SE NW, Section 10-8-6, Bowlegs Pool, swabbed 377 bbls. from the Wilcox sand at 4,594-98 feet. Tidal Oil Co.'s No. 5 Harjoche, SE cor. NW SW, Section 10-8-6, made 630 bbls. when shot with 30 quarts in the Wilcox sand at 4,290-4,305 feet. Sinclair Oil & Gas Co.'s No. 6 Ellen, NW cor. NE SW Section 1-8-6, is dry and abandoned at 4,410 feet in Wilcox sand topped at 4,273 feet.

Mid-Continent Petroleum Co.'s No. 3 Smith, SW cor. SE SW Section 12-8-6, Bowlegs Pool, found the Wilcox sand at 4,284 feet, drilled to 4,293 feet and made 130 bbls. in 11 hours after a shot of 20 quarts. Magnolia Petroleum Co.'s No. 1 M. Davis, NE cor. NW NE Section 13-8-6, swabbed 344 bbls. from the Wilcox sand at 4,256-62 feet when shot with 15 quarts. Indian Territory Illuminating Oil Co.'s No. 1 Burden, NE cor. NW SW Section 23-8-6, drilled the Wilcox sand from 4,604 feet to 4,620 feet and made 65 bbls. after two shots. Sory & Swartz' No. 1 Turner, SE cor. SW SE. Section 26-10-5, is a dry hole at 4,650 feet.

Empire Gas & Fuel Co.'s No. 1 Butner, SW cor. SE Section 3-9-8, drilled to 3,560 feet and plugged back to 3,525 feet and made 25 bbls. Independent Oil & Gas Co.'s No. 2 E. Cobb, SE cor. NW NE Section 7-9-8, is making 70 bbls. from sand 3,300-07 feet. Indian Territory Illuminating Oil Co.'s No. 2 Phoebe "A" swabbed 832 bbls. from the Wilcox sand at 4,413-18 feet. Magnolia Petroleum Co.'s No. 6 Franz, NE cor. NW SW Section 32-8-8, Wewoka Pool, has been completed for 200 bbls. in the Wilcox sand at 4,151-60 feet.

Indian Territory Illuminating Oil Co.'s No. 1 Camp, SW cor. NE NW Section 1-7-6, Little River Pool, swabbed 283 bbls. from the Wilcox sand at 4,269-72 feet. No. 1 McCulla, NE cor. SE NW Section 1-7-6, made 371 bbls. on the swab from Wilcox sand at 4,487-90 feet. No. 1 Soketheche, NE cor. SW NE Section 1-7-6, produced 537 bbls. from the Wilcox sand at 4,447-49 feet. No. 6 Soketheche, SW cor. NE Section 1-7-6, is dry and abandoned at 4,447 feet in the Wilcox sand topped at 4,428 feet.

Pawnee County

R. O. Freeman and others' No. 1-A Wells, NW cor. SE SW Section 16-21-7, is dry and abandoned at 3,117 feet.

Stephens County

Margay Oil Corp.'s No. 1 Karschner, SE cor. NW Section 7-1s-8w, is drilling deeper at 2,652 feet. David Malernee, NW cor. NE NE Section 34-1s-8w, is being deepened and now drilling at 1,460 feet. Wirt Franklin Petroleum Corp.'s rig is going up for No. 1 Crews, SE cor. NE SE Section 12-1s-4w. Magnolia Petroleum Co.'s No. 2 G. Martin, NE cor. NW NE, Section 13-1s-4w, is a rig under construction.

Smith-Law Co.'s No. 5 Brymer, NW cor. NE NE Section 31-1-8w, was completed for 3,000,000 feet of gas in sand at 1,365-75 feet. Pearce & Brown's No. 1-B Wilkinson "B," SW cor. SE Section 27-1s-8w, is pumping 80 bbls. from sand at 1,677-79 feet.

Tulsa County

Holmes and others' No. 1 Okla Oil Co., CNL SW SE Section 14-19-10, is drilling at 500 feet. Munn Brothers and others' No. 2 Cahwoe, NE cor. SW SE Section 10-18-12, was deepened to the Turkey Mountain sand at 2,225-32 feet and abandoned. Hilt and others' No. 5 Oswalt, NE cor. SE SW NW Section 6 17-13, came in for 300 bbls. in the Dutcher sand at 1,845-51 feet. L. C. Butler's No. 2 Billy, NE cor. SW SE Section 32-17-14, is dry and abandoned in Wilcox sand at 1,894-1,905 feet. J. Crider and others' No. 2 Johnstone, SE cor. SW, Section 15-16-12, was completed for 25 bbls. in Dutcher sand at 2,105-06 feet.

Wagoner County

O. A. Sewell and others' No. 1 Adkins, SW cor. NW SE Section 13-17-15, is rigging up. Boyd & Hanks' No. 4 Escoe, C NE SW Section 7-18-15, is dry and abandoned at 1,300 feet. Towner & Witt's No. 1 Luckey, SW cor. SE NW Section 1-18-7, is a dry hole at 830 feet. H. W. Lampton's No. 2 Rulison, CNL SE SW Section 9-15-16, had a show of oil at 1,247 feet and has been abandoned at 1,280 feet.

ENGINE MANUFACTURERS FORM AN ASSOCIATION

Internal combustion engine manufacturers serving the oil fields and a considerable number of internal combustion engine manufacturers serving the general industrial field have formed an association to be known as "The Society for the Development of Internal Combustion Power." The organization meeting was held in Cleveland on November 16 and 17.

Among the officers elected for the coming year are the following, well known in the oil fields: C. F. Fithian, Bessemer Gas Engine Co., Grove City, Pa.; first vice chairman, D. R. Shouvlin, Superior Gas Engine Co., Springfield, Ohio; second vice chairman, M. J. Anderson, St. Marys Oil Engine Co., St. Charles, Mo.; secretary, H. L. Hileman, Joseph Reid Gas Engine Co., Oil City, Pa.; assistant secretary, E. P. Ziegler, Franklin Valveless Gas Engine Co., Franklin, Pa.; treasurer, C. P. Clark, Clark Brothers, Olean, N. Y. The election of individuals for the executive committee will be held at the next regular meeting.

Representatives of manufacturers of all types of engines attended the meeting and among the features were a number of very interesting papers concerned with oil field activities.

Offices will be maintained at Titusville, Pa., in charge of Harry Botsford.

BLAFFER CASE JUDGMENT

AUSTIN, Tex., Nov. 26. — Formal judgment giving the State about $3,400,000 in its recent recovery of title to 265 acres of oil land in the San Jacinto River bottoms of Harris County, was entered in district court after operating expenses of several oil companies, mainly The Texas Company, had been deducted. The judgment gives recovery of about $1,400,000 in cash for oil taken from the disputed tract, Assistant Attorney General Joe Brown said. The land is valued at $2,000,000. The oil companies will appeal the case.

McEVOY WIRELESS WELL STRAINER and McEVOY PRODUCTS

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McEVOY "WIRELESS" WELL STRAINERS can always be set without damage, and their inlet area, "straining capacity" and delivery of fluid, is second to none. They need no "run around" arguments to demonstrate their operation, as that is taken care of by least resistance, according to sand conditions.

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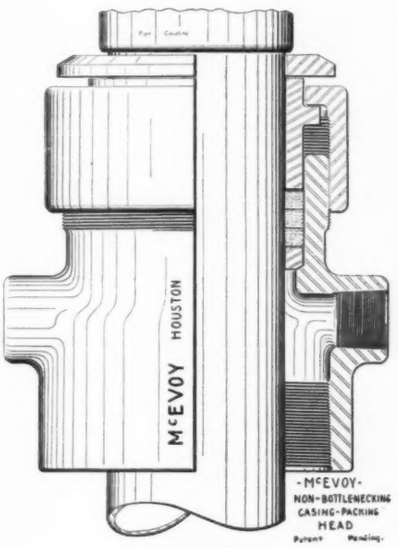

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FOR SALE—Little used, equal to new for work, Armstrong 25 special Kerosene Tractor drilling machine. Has the patented derrick to use steel drill line and with it tools with bits starts 16 down to 6 inch hole. Immediate delivery. Address Box C-125, The Oil and Gas Journal, Tulsa, Okla.

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5 Dean Triplex Pumps, 5 by 8.
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Two 10-inch S. Roturbo Centrifugal Pumps. Six 10-inch S. Centrifugal Pumps. Steam Turbine.
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FOR SALE—5½ Keystone Steam Tractor Driller with combined friction and gear hoist. Good condition ready for work. Boiler recently reflued. Address Box C-128, The Oil and Gas Journal, Tulsa, Okla.

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OHIO IRON & SUPPLY CO.,
Lima, Ohio.

FOR SALE—Air compressors. Curtis 15⅝x2, Rix 2½x3. Particularly suitable for tire shop, filling station or gas testing machine. P. O. Box 578, Tulsa, Okla.

FOR SALE—Practically new Armstrong 50 walking Beam and calf reel type all steel tractor drilling machine, powered with four cylinder Buda motor. For further information address Box C-124, The Oil and Gas Journal, Tulsa, Okla.

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WANTED—Drilling contract for small over-riding royalty interest in 160 A lease, Logan County, near McCully well. N. E. quarter, Sec. 3, Twp. 18n, Range 4w. Write Mrs. C. J. Barker, 800 Main, Kaw, Okla.

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FOR SALE—Boiler and tank repair shop located in center of oil and gas field, in town of 8,000; this will bear investigation. For further information write. Westerman Bros., Bremen, Ohio.

WILL PAY CASH
For gas situations having income $100,000 or more.
P. J. MINCK,
720 So. Kenosha Avenue, Tulsa, Okla.

PARTNER WANTED with $5,000 or $10,000. Prefer partner who can give time to business and who has had experience using heavy tractors and Athey wagons for moving oil-field supplies, handling ditching and dirt-moving jobs, skidding rigs, and general oil field contracting. No boozeheads need apply. Excellent money-making opportunity for right man. Write or telegraph Alex Bradford, The Tractor Man, P. O. Box 153, McCamey, Tex.

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FOR SALE—We have the stockholders names in over 1,000 oil, mining and other companies. Answer this. Will send itemized price list showing each one and price. No charge. A. F. Williams, Manager, Dept. T, 166 W. Adams, Chicago, Ill.

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We can make you a good proposition to drill one or a series of wells in one of the best shallow oil fields in Texas. Have drill, pipe and leases or will drill yours. Ray Smith, Box 40, Fry, Tex.

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Do you need money to finish or go below contract depth? We may be able to assist you, write stating location and depth of well, kind of rig, amount of acreage, condition of hole, contract depth and all other information possible. Send geological map and report if you have one. Box C-33, The Oil and Gas Jouranl, Tulsa, Okla.

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HAVE NEW DESIGNED Diamond Core Drill to be manufactured and sold on royalty basis, run by gasoline power and has flexibility of steam drill. P. O. Box 3421, Tulsa, Okla.

OWNER OF North half Sec. 92, Blk. O, W. Pecos Co., Texas, wants propositions, E. M. Barrett, Crescent City, Fla.

I WANT CONNECTION with responsible Oil Co., Drilling Co. or individual who will take on large prospective oil field, in new territory, for development in the near future. This field has been passed on, favorably, by leading geologists. Box 249, Holdrege, Neb.

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DELAWARE incorporators. Charters fees small, forms. Charles G. Guyer, 901 Market St., Wilmington, Del.

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WANTED—Chief geologist for major company. Must be ethical, up to date, well known and thoroughly experienced in Texas and Oklahoma. Right man can secure suitable salary, permanent and congenial employment and be given opportunity to make money. All replies confidential. P. O. Box 683, Ft. Worth, Tex.

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Successful salesman, experience selling power plants, can secure permanent, profitable connection. Acquaintance with industrial buyers desirable. Proven products, backed by a surety bond. Sell to every industrial plant, public institution, hotel and all buildings. 100 per cent cooperation. Personal training given. Give details. Replies confidential. Position available January 1, 1928.

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PETROLEUM And MECHANICAL Engineer. Seven years field experience, scouting core study air and gas lift production, gas plant, design and operation. Salary $300 anywhere. Box C-112, The Oil and Gas Journal, Tulsa, Okla.

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YOUNG OIL CHEMIST, single, 2 years experience, desires position with Oil Co. in South America. Carl W. Kirkwood, Summerland, Calif.

SUCCESSFUL sub-surface geologist, now employed, 6 years experience Mid-Continent field, desires position; part or full time. Box C-115, The Oil and Gas Journal, Tulsa, Okla.

ADDRESSES WANTED

WANTED the address of Roy Watkins driller. Worked at Desdemona and Mirando City, Tex., and later at Webb City, Okla. Between 35 and 40 years old. Box C-110, The Oil and Gas Journal, Tulsa, Okla.

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NEW MEXICO oil leases; Lea, Eddy, Chaves, Union, Quay and all other active counties; complete list and map on request. Orcutt-Harris & Co., Colcord Bldg., Oklahoma City, Okla.

OIL LEASES and royalties. Ector, Crane, Pecos, Reeves, Ward, Upton and Winkler Counties; buy or sell. C. H. C. Anderson, 712 Linz Bldg., Dallas, Tex.

SOUTHWEST TEXAS — WINKLER, Loving, Reeves, Ward, Pecos, Culbertson Counties.
Drilling blocks, Leases. Royalties.
Ranches in fee.
H. F. Anthony, Pecos, Tex.

LEASES, Royalties and drilling blocks bought for you. Special land lease and geological service anywhere in West Texas to operators and those interested in this territory, rendered at reasonable fees. We have every facility to serve you. World Oil Co., Land Department, Fort Worth, Tex.

NEW MEXICO—Leases in Lea and Roosevelt; cheap royalties in Roosevelt and Guadalupe; leases in any county; information regarding New Mexico developments. William U. Tate, Franciscan Hotel, Albuquerque, N. M.

FOR SALE
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Have another lease 11 years old pumping 12 barrels per day, will sell these separate, or all together. Box No. 94, Scottsville, Ky.

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Underlaid with many Oil and Gas pools like Seminole area but at shallow depth and cheap drilling cost. WE HAVE 800 acre block in central producing area on structure, $2 per acre and well; also best leases and royalties, attractive prices. Highest reference furnished.
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First National Bank Bldg.,
Chickasha, Okla.

WRITE FOR PRICES on leases, royalties, and farm lands on Sweetgrass Arch.
KEVIN-SUNBURST HOLDING CORP.
Box 313, Shelby, Mont.

HAVE SOLID BLOCK choice acreage on promising Montana structure. Drilling starting now close by. Want financial help. Box C-123, The Oil and Gas Journal, Tulsa, Okla.

HAVE GOOD Custer, Washita and Caddo County oil leases for sale from $1.50 to $6. Right on the structures where the companies want them, also drilling blocks. Write me where you want your leases and I will make you a good price. J. J. Sallaska, Corn, Okla.

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Southeastern New Mexico and West Texas counties — Lea, Eddy, Chaves, Gaines, Andrews, Winkler, Loving, Ward, Culberson and Pecos Counties, oil and gas leases, royalties and drilling blocks. We buy and sell. F. S. Blackmar, P. O. Box 541, Roswell, N. Mex.

FOR LEASE—App. 1,800 acres Upton Co., Tex. S. 6, Cert. 1912, J. E. Hamilton survey 6 mi. North Burleson district — make offer — might consider drilling proposition. Owner, 341 W. Sunset Ave., Hawthorne, Calif.

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Since the Pecos oil field has proven to be the largest oil pool in our country, the major oil companies are playing this Section of Texas very heavily. Can furnish 10-year fully paid oil leases in one or more sections lots jam up against blocks recently purchased by the major oil companies, in Sutton, Edwards or Kimble Counties, from $2 to $3 per acre. R. E. Moore, 214 Dan Waggoner Bldg., Fort Worth, Texas.

LEASES—PRODUCTION

FOR SALE—Oil leases and royalties. Coal County, Oklahoma. Phone 5270.
J. H. LEAVITT,
309 North Harvey, Oklahoma City, Okla.

DRILLING BLOCK given on 10,000 A. Baldwin Co. Ala. Have geology. E. Angell, 500 Diversey Parkway, Chicago, Ill.

UNUSUAL OPPORTUNITY; have block 10,000 acres; Eastern Kansas; 30 miles Kansas City. Geology and three correlated 2,500 ft. encircling wells show large enclosed sub-sturcture 350 to 400 ft. in height and two oil saturated horizons of more than 100 ft. in thickness each. More than 500 oil and gas wells 225 to 500 ft. in depth encircle the district. Considered a large gas proposition. Both oil and gas pipe lines across the block. Want drilling offer. Dr. E. E. Paddock, Kansas City, Mo.

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U. S. GEOL. SURVEY report shows my oil leases cover lands considered favorable for oil and gas. 900 acres my leases on Anticlinal Structure already worked out. 320 acres directly in center of government permit on said Anticline. Priced very reasonable. Low rentals. W. M. Breuer, 2004 Carlton St., Ft. Worth, Tex.

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FOR SALE—Half section considered proven for good Glenn production, should prove valuable property when developed, some old settled production now on lease. Proves several other producing sand possibilities; will sell outright or give interest for development. Address P. O. Box 3444, Tulsa, Okla.

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LEASES
State lands well located. Write for description and price.
LOS ANGELES-NEW MEXICO
OIL CO.
114 S. Los Angeles St., Los Angeles, Cal.

LEASES for sale near 596 ft. hole, 200 ft. were lead, 276 ft. zinc. Owner, Wayne Hotel, Tulsa, Okla.

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FOR SALE—Leases, Oil Production, Asphalt, Lime Stone and Other Mineral Lands. W. P. Harley, Bowling Green, Ky.

WINKLER—PECOS COUNTIES
Leases and Royalties
W. S. PATTERSON
Pecos, Texas

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WEST TEXAS ROYALTIES
FOR SALE
Of prime consideration is the geological work accompanying each sale.
J. F. MARION OIL COMPANY
1213 Magnolia Bldg., Dallas, Texas.

NOTICE
Offering undeveloped and producing royalties, leases and drilling blocks, Brown (Fry Field area), Coleman, Callahan and Shackelford Counties, Texas.
All offerings submitted will be accompanied by geological information.
M. ELDER & COMPANY
Coleman Hotel Bldg., Coleman, Tex.

ONE ACRE of oil royalty in Pottawatomie County, Oklahoma, for $30. Might be worth $5,000. Box 8, Tecumseh, Okla.

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WANTED—To buy around one hundred barrel production Okla., Kas. or Texas. Give full particulars. Box C-113, The Oil and Gas Journal, Tulsa, Okla.

WEST TEXAS

FEE—LEASES—ROYALTIES
Wholesale—Retail
I have a very interesting Pecos County block of perpetual royalty—large or small tracts.
J. S. JONES
First Nat'l Bank Bldg.,
Ft. Stockton, Tex.

FOR SALE—Owner retiring, desires to sell interest old settled production only partly developed, a dozen proven locations. Box 523, Okmulgee, Okla.

CAN FURNISH ½ perpetual participating royalties with or without 10-year lease, Western Oklahoma Counties $1.50 and up. Joe P. Crawford, Petroleum Bldg. Oklahoma City, Okla.

IF YOU buy or sell royalties, leases or production you should not overlook The Oil and Gas Journal Classified Wants. They comprise the best medium of exchange available to you.

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West Texas royalties—Winkler, Ector, Pecos, Yoakum, Gaines, Andrews, Brewster, Presidio, Jeff Davis, Hudspeth, Val Verde, Terrell counties. Available in units of $25 and up. Write for list. Mid-West Lease & Royalty Corp., P. O. Box 488, Fort Worth, Tex.

QUICK ACTION ROYALTY
1/32nd of 1/8 of royalty on 160-acre offset to Deep Rock well now drilling, Block A-46, Andrews Co., Tex., warranty deed, recorded in your name, $40. Mid-West Lease & Royalty Corp., Box 488, Fort Worth, Tex.

DEED ROYALTIES — Get in on ground floor in Lea County, N. Mex. Ten acres up to a section or more. Wire or write BLUE QUAIL ROYALTY ASSOCIATION, Box 383, Odessa, Tex.

FOR SALE. Unusual opportunity, to get in on ground floor, shallow production, six miles 4 and 5 inch line supplying domestic and commercial gas. Almost unlimited possibilities in sale and production. Seven new wells, northeastern Kansas. Drill rig on ground, plenty of acreage. Price $20,000. Reason sickness. C. K. Smith, 806 Rialto Bldg., Kansas City, Mo.

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THE WESTERN GOLD MINER, free trial subscription. 2586 W. 37th, Denver, Colo.

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DO YOU NEED MONEY for organizing or financing oil or mining deals? Write 131 E. 13th, Oklahoma City, Okla.

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25 West Forty-third, New York.

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7 lines	2.45	4.20	5.95	7.70
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BUY FROM THE OWNER
LEASES—RANCHES—ROYALTIES
Thirty years a resident in the Center of West Texas. We know the Ranchmen, and can obtain the Best Prices.
T. L. BENSON,
306 S. Chadbourne St., San Angelo, Tex.

FOLLOW
MID-KANSAS OIL & GAS CO.
into
Brewster County
40 to 400,000 acres
Turney ranch and other lands.
Write for geological maps.
R. E. PLUMBE
646 First Nat. Bank Bldg.,
El Paso, Texas.

WANTED

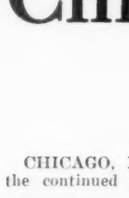
CAPITAL WANTED
By small oil company with 70 barrels of settled production in the Smackover Field. Additional capital will be used to buy producing oil properties. Reliable and experienced oil man in charge. References furnished. P. O. Box 1495, El Dorado, Ark.

Chicago Demand Restricted By Rain

Orders Against Contracts Have Been Very Light. Quoted Price for Gasoline Was Commonly 6 Cents

By J. B. Waldo

CHICAGO, Nov. 28. — The result of the continued mild, rainy weather has been to restrict the demand in the spot market for practically every petroleum product and the orders against contracts have also been rather light. The spot demand for gasoline was almost entirely for single cars. The quoted prices for U. S. Motor gasoline was quite commonly 6 cents, although some refiners still held for an eighth higher. Jobbers stated in several instances they had quotations for less but they were usually for deliveries only to certain parts of the territory and generally the gasoline market, though easy, was not changed as to prices.



Kerosene moved very slowly on Monday but the market was steadily held. The furnace oils were all dull but no change in quotations was noticeable all waiting for a cold snap.

Resistance to Reductions

In the heavier grades of fuel oils some very close quotations have been made with the hope of stirring up some business, the trade arguing that there is business to be had but that it must be gone after and worked for, not waited to come in. There is good resistance shown to any lowering of prices in low cold test fuel and gas oils, the weaker tendencies being in the oils with a rather high cold test which continue to be freely offered while the zero oils are much more firmly held. Industrial users have generally covered their known requirements for December and it is too soon for inquiries for January and some improvement in the demand for all products is expected a little later in the week.

Many Contracts Signed

There was, as usual at this time of the year, a great deal of activity last week in the signing of contracts. Many dealers were in the city from surrounding territory arranging for supplies for the coming season. Local cut prices have made dealers anxious to get contracts based on local tank wagon prices and giving them local protection. Some of the refining companies have done this to a limited extent in the past, but in most of these instances the contract contains a cancellation clause which will permit the refiner to cancel the contract and stop his losses.

The refiners do not always use the opportunity to cancel the contract, but it gives them protection which may be exercised if necessary. Several instances have come to the writer's attention recently where a company has not only not exercised the option but has given its dealers written assurance that the company would stand back of them in the fight for gallonage and see them through. Of course this has produced a friendly feeling on the part of the dealer toward his source of supply and makes for enduring relations.

So far as known the dealers in each of these instances have been innocent parties in the local price war. They have not made the first cut and have met it only when they were forced to do so by the loss of business. Such a contract is as far as any responsible refiner can go. He becomes through it an influence against the easy surrender on the part of the dealer to the possible development of cut prices from unimportant local competition. One small dealer with a possible distribution of a car of gasoline a month should not be a sufficient reason for the wholesale cutting of prices in a city where the combined distribution of the other dealers who do not want to cut their gasoline price is 10 or 20 times the largest quantity of gasoline that the cut-price dealer can distribute.

Slow to Stock Up

The market was perhaps a little easier towards the close of last week. The weather was not generally favorable to a large distribution and the dealers see no reason why they should stock up. If they did do so as they have in some years in December, stocks are so limited in the Mid-Continent Field that prices would be greatly strengthened but there seems little chance of this taking place. The distributor of gasoline and other petroleum products is doing what other dealers in his locality are doing, letting the manufacturer of his supplies carry the stock. If they continue along this line there is no reason to look for any distinct change in marketing conditions during the next few weeks.

There is always a possibility of some sudden reversal of conditions in the oil industry but these are usually due to some factor that has been overlooked rather than to the sudden appearance of a new condition. Just before Thanksgiving some of the refiners who had been maintaining a 6¼-cent price, found that their business aside from their contracts was growing so small that it amounted to practically nothing and dropped their price to 6⅛ cents while others quoted 6 cents freely and quite a volume of business was booked just before the holidays on a 6-cent basis.

After reducing all of their gasoline prices an eighth of a cent some refiners found themselves still above the going market, which was 6 to 6⅛ cents with a growing frequency of 5⅞ cents purchases reported as made by dealers in the country, direct from refiners some of whom were quoting that price both to the distributor and for resale. The higher gravities were also a little easier. There were reports of some export buying from North Texas refiners of the 64-66 375 endpoint at a price stated to 6⅝ cents out of North Texas or practically 6¾ cents out of Group 3.

The demand for the antiknock gasoline was good and seemed to be increasing as refiners who have recently come on the market with a new product in this class state that they are selling readily their entire output. The natural gasoline demand was not large here. The chief local demand was for the A and AA grades. The situation in Ohio was still bad and some quotations were made for Detroit delivery by near-by refiners that were much below the Group 3 basis, one set of quotations from a northern Ohio refining city figuring between 5¼ and 5½ cents.

Kerosene Weaker

Kerosene has weakened a little in the spot market, some refiners who had been above the market reducing their prices an eighth of a cent, only to find that they were still above the quotation readily obtainable by buyers in the country districts. Leading refiners and marketers were quoting 4½ cents freely and an occasional price of 4⅜ cents was noted, although not general. Although there has been some export buying, supplies seem very ample and it is no longer a case of delay in shipments as supplies are immediately available from several sources. The domestic demand is not active at present.

Distillates showed some firmness and while prices had much the same range, there were more refiners quoting the higher price of the list. The new business developed in the spot market was just fair, the chief movement being on contracts. Some large refiners have not sought contracts, but are taking care of their regular trade at the market price, which for a straw 38-40 gravity with a low flash remains at 4¼ to 4⅜ cents.

There was little cold weather last week over this section. Several storms were reported as developing in the West and forecasts were issued of much lower temperatures, but they did not materialize and the consumption was not greatly stimulated. The demand as a whole was less active last week than for the week preceding which is accounted for by the fact that supplies were ordered out the first week and they filled the dealers' tanks so that they had no deed to draw further on the refiner. So far this season we have had no really cold weather.

The demand for gas oils has been good but not as active as for the preceding week. There are free offerings of straight run gas oils and while the larger gas companies are well supplied and have just begun to draw on their stocks, they have been tempted by the cheap prices offered and have bought for some points. Some straight run dark gas oil was sold to these large buyers at 2¼ cents and even straw gas oil with a rather high cold test around 50 degrees was bought at 2⅝ cents, while for industrial buyers the price in smaller quantities ranged around 2½ cents. The demand from distributors for low cold test oil was not as active as for the preceding week but some business was done, the prevailing prices being 2⅝ cents for a dark cracked gas oil and 2¾ cents for a straw cracked gas oil. The cracked product was less freely offered than the straight run, but there was a fairly liberal offering. Some of the refiners who have contracts had sufficient accumulations to care for all the business done during the recent period of activity in demand either spot or on contract and as they see no immediately active market and are continuing to produce they are willing to take business at the prevailing market as they sense additional accumulations before the dealers are again in the market for supplies in quantities.

Fuel Oil Market Slow

In the fuel oils the demand is slow at best as the buyers are holding their orders at the lowest possible minimum. One large industrial unit was asked to take in five cars each at its two plants, one of which is closed down and the other operating on replacements and repairs. Their stock of oil is practically used up at the closed plant and is low at the operating plant. The purchasing agent admitted that conditions were such that he should place an order but said that he could not put it over with the management who insisted that he buy, as the company received the orders. This the buyer said indicated that at any time he might be in the market for a rush delivery if they booked expected business but until the business was actually an order, not a good prospect, he could not buy. This is a typical condition.

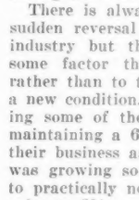
Some of the steel companies report that they are booking larger orders and that conditions are improving. There are rumors of large orders to be placed by the railroads. In many cases these orders will be split up among a number of mills and none will get enough business to insure continued operations for any length of time. Low inventories at the close of the year seem more than ever

TREND IN THE EASTERN MARKET DOWNWARD BECAUSE OF WEATHER

By N. O. Fanning

New York Bureau, The Oil and Gas Journal, Room 629, No. 101 Park Avenue, New York, N. Y.

NEW YORK, Nov. 26. — The refined oil markets turned somewhat downward during the past week, due largely to smaller demand caused by unfavorable weather. The movement of gasoline into consumption was not up to expectations and this was reflected in a new outbreak of price cutting among retail dealers in certain sections.



Both furnace oil and kerosene were in small demand and refinery prices were shaded by some factors. The weather has been unusually warm during November. Excessive rains prevented this factor from helping gasoline consumption to any great extent, while the warmth has restricted consumption of burning oils.

Leading oil men here continue to take a somewhat pessimistic view of the situation. They are not going into 1928 with any false hopes, if they can help it.

The oil export situation has a somewhat rosier tinge due to more inquiries for early 1928 delivery and a better current movement. However, nothing has happened to bring about excessive optimism.

Gasoline

While leading refiners were quoting United States Motor gasoline at 8¼ cents in tank car lots along the Atlantic Seaboard, some transactions at 8 and 8⅛ were reported for large lots. The market seems to be shifting somewhat to the buyers' advantage, while a week ago the situation was just the opposite. Perhaps bigger receipts of Mid-Continent gasoline in this market were a factor in this connection.

On the other hand, receipts of California oil on the Atlantic Seaboard have declined substantially in the past few weeks, and practically no gasoline is coming in from that source. This has relieved the situation along the Atlantic Coast to some extent, offset somewhat, however, by an occasional shipment of cheap Trinidad or Mexican material. A cargo of Trinidad gasoline was unloaded at New York harbor during the week and was distributed to stations in and about New York City. While it is understood this is mixed with natural gasoline before being retailed, this cannot be confirmed.

The low prices that have prevailed for gasoline during the past six months seem to be having the effect of restricting the expansion of retail outlets. It is quite noticeable that the building or locating of new service stations is not at the feverish pace set during the early part of the year. This is not a direct factor in the market yet, but if the proper restraint can be practiced until next spring, it is likely the retailers will reap their reward. It is generally admitted in the trade that with present outlets, a much bigger consumption of gasoline could be handled, without adding to the total.

Kerosene

Failure of the tank wagon kerosene market to advance is regarded as an indication that the recent advance in refinery quotations may not be maintained. Some refiners are shading the 7½-cent

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the one thing that the management of many concerns seems to consider an ideal condition. They do not want even orders placed for delivery after the first of the year. A large list of assets including the best possible cash balance with small liabilities, immediate or incurred for the future, seems to be the aim of many industrial managers.

With this outlook the December business is likely to be a routine one in the industrial branch of the fuel oil business. Much depends on the weather man when it comes to the demand for fuel oils for heating purposes. This demand is uncertain, but it might be large. In the meantime supplies are ample. Offerings are freely made and while the prices are not materially reduced there has been an easier tendency.

Oils with a really low cold test and low sulphur content have the first place in the demand and on these prices have been fairly well maintained but the oils with only a fair cold test and a little too much sulphur have been offered and purchased for less money. Occasionally a refiner will find it desirable to move an accumulation of fuel oil and in some cases these tanks have been placed with dealers to dispose of at the best figure obtainable. The general result of these conditions is that refiners and car lot dealers in fuel oils are working on narrow margins.

Lubricating Business Steady

The lubricating oil business is slow but refiners say it is steady. There is a good deal of shopping around for prices and the situation in this respect is unsettled by the action of refiners who have stocks to move and also by those who have a name for their product to make. So much of the lubricating oil business is now done on contract that the movement is often very fair with little evidence of activity in the sales departments.

One feature of the situation, the making of contracts by refiners that oblige the distributor to handle the entire line, is forcing many changes. The Vacuum Oil Co., in a recent large space advertisement in the daily press in this city, said that its oils would be found on sale at all good dealers "not controlled by gasoline refiners."

Recently the sales head of the Sinclair Refining Co. said that company was about ready to insist that its gasoline customers handle its motor oils as well. With a number of refiners, including some of the Standard companies, the rule of "gas and motor oils or no gasoline" has worked against the refiner of lubricating oils alone. The Standard Oil companies have put in their own oils at their stations and the large independent refiners in many cases have worked up a large and profitable business in motor oils through the rule that their contract customers must handle their lubs as well as their gas. Some of these make a high-grade line that competes with the best and their dealers do not suffer from a comparison of their branded oils with those of the special refiners.

The next step will be for some of these large refiners of lubricating oils to arrange for a gasoline supply either through the acquiring of a refinery or by a contract arrangement with some refiner of the lighter products whose plant does not include a lubricating department.

Tank Wagon Prices Cut

The tank wagon situation has undergone no real change. There has been no general reduction in the tank wagon scale by the Standard Oil Co., over its territory or elsewhere. Prices are cut at many points and recent attempts to adjust them at some points have not been successful. One of the sections of the territory where prices have been badly cut is northern Indiana. South Bend is an important point and the price there was reduced some time ago to 15 cents flat at station and wagon, including a 3-cent state tax.

Early last week all the dealers agreed to restore the normal price and did so with the exception of the Standard Oil Co., and the Sinclair Refining Co. Apparently each was waiting for the other to move as each one said that it would go up when the other one did. Neither made a move and later in the week the dealers who had advanced their prices went back to the cut price.

At Toledo, Ohio, much the same condition prevails. The full price is 19 cents, including the state tax. All the companies cut to 15 cents and some small dealers to 14 cents with the Standard Oil Co. of Ohio and the Hickok Producing Co. holding for the regular price. Another case is that at Bloomington, Ill., where the tank wagon and station price is now 10 cents, including the state tax. Several of the smaller organizations have taken their wagon off the road and are selling only through their stations at the 10-cent price.

Now the strange argument is made that the smaller dealers are enabled to stay in business through the action of the Standard and The Texas Company and other large companies who sell to the smaller dealers in tank wagon lots at a price that with the Q.D.A., permits them to exist if barely so. These cuts in price are localized to some extent although they have a tendency to spread.

Cut-Price Towns Popular

Motorists who drive to a cut-price town naturally fill up on cheap gasoline and their local dealers lose this business. Then others find it convenient or possible to visit the place where cheap gasoline is obtainable. It is an actual fact that motorists will drive 20 miles and more to save 3 to 5 cents on gasoline.

TREND IN THE EASTERN MARKET DOWNWARD

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level of water white kerosene at refineries down to as low as 7¼. Prime white is moving at as low as 6½.

As stated, the unseasonably warm weather has reduced sales of both kerosene and furnace oil for home heating. In the furnace oil trade, the effect of this is just beginning to be felt. Owners of domestic oil-burning units had stocked up at the beginning of fall in anticipation of an early winter as in 1926, but as their supply has held out better than expected, they are not replenishing as they otherwise would be at about this time.

Refiners are understood to be well stocked with furnace oil, having anticipated a somewhat bigger demand. The favorable export position of kerosene, however, has helped relieve the situation considerably, and in the event of a turn toward colder weather, kerosene prices should firm up somewhat.

Gas and Fuel Oil

Gas oil is unusually firm. It is in good demand in connection with the Diesel trade. Sales of both gas oil and Diesel oil are unusually heavy. Gas oil of 26-28 gravity is being sought by domestic and foreign Diesel engine users, due to certain qualities of advantage during colder weather.

Bunker fuel oil continues weak due to a steady flow of heavy crude and fuel oil toward the Atlantic Seaboard. Low freight rates have given the opportunity to ship fuel oil to the Atlantic Coast at a profit greater than that afforded by Gulf Coast oil prices, but this advantage is being automatically wiped out.

One of the largest marketers of bunker fuel oil on the Atlantic Coast is now marketing Venezuelan fuel oil here on a large scale for the first time to replace Mexican fuel oil. In addition, receipts of West Texas crude here are growing. This crude is being topped and the resulting fuel oil yield is being marketed in competition with other fuel oils. Although there may be an additional cut in the price of fuel oil of, say, 5 or 10 cents a barrel, barring unforeseen developments that will be the limit of the cut. Freight rates are about as low as they can get for the movement of fuel oil to the Atlantic Coast from other sources, and unless prices for heavy crude are cut further, the fuel oil market should be considered pretty close to rock bottom, according to students of the market.

Lubricating Oil

There has been a lull in the lubricating oil trade. Sales to the industrial trade have failed to recover to any extent. The motor and railroad demand is holding up as well as might be expected. However, the market in general is not acting as well as could be hoped.

The domestic demand for steam cylinder oils has suffered particularly. Western refiners in some instances are pressing material for sale in the eastern market, although this territory is already apparently well stocked. The natural result is keen competition for business.

Red and pale paraffin oils are also lagging, but prices are holding up, as refiners and jobbers do not seem to be so well stocked with them. Bright stock oils are dull, but there has been no further shading of prices.

Marketers of lubricating oil were somewhat encouraged by the outlook for the decline of the Seminole Field, but the sudden comeback registered by output there has caused a little uneasiness over the price situation. It is believed here West Texas crude will not have much effect on the lubricating oil market, so that with Seminole out of the way, the situation in the trade should be much stronger.

Paraffin Wax

Following the recessions of a week ago, the paraffin wax market has quieted down. Demand is said to be much better at current prices, especially for refined wax. There appears to be a considerable amount of crude scale wax on the market. Some exporters of crude wax are reported to be overstocked and offering their surplus back on the domestic market.

The movement of refined wax into domestic industrial channels is still at a restricted pace, and marketers do not hold out much hope for improvement now until after the first of 1928.

Petrolatum

The petrolatum market continues strong with an especially good demand for snow white, lily white and cream. The failure of dark green to go along with the rest of the market has been a disappointment to many, who were well stocked up with that grade. It is expected that improvement will come in due course.

The Export Situation

The oil situation in Europe is not much changed, according to reports from abroad, which say that as in the United States, quotations seem to have reached bottom. At least the orgy of price cutting in gasoline has subsided, and there are no indications it will be renewed for the present.

Substantial inquiries for gasoline have been reported here from European sources. During the past week more than 7,000,000 gallons of gasoline went into export channels, and about 3,000,000 gallons of kerosene.

Exports of refined paraffin wax were fairly large, but crude scale wax lagged.

The foreign movement of oil in cases held up well. The exportation of cased gasoline for the week ended November 23 amounted to over 1,500,000 gallons and of cased kerosene was over 1,800,000 gallons.

The export market for lubricating oils lagged somewhat. Local exporters reported some inquiries for barrel lots, but practically nothing in the bulk and case divisions.

The following table shows principal exports of petroleum and petroleum products from New York during the last three weeks (all figures in gallons unless otherwise noted):

	Nov.23	Nov.16	Nov.9
Gasoline:			
Bulk	7,264,700	.....	.....
Cases	1,562,290	335,400	336,900
Kerosene:			
Bulk	3,003,800	.....	.....
Cases	1,879,930	552,760	449,930
Lubricating oil:			
Bulk	187,300	.....	.....
Barrels	1,159,900	899,200	337,250
Cases	271,930	52,100	74,140
Paraffin wax:			
Bags (lbs.)	1,288,540	979,000	356,400
Barrels (lbs.)	299,250	190,000	483,075
Petroleum asphalt:			
Barrels (tons)	678	.....	2,623

The foregoing figures include all shipments of 500 bbls., 1,000 cases, or more.

The receipts of crude and refined oil by tanker at Atlantic Coast ports during the week ended November 23 are estimated at 3,700,000 bbls., a daily average of 529,000 bbls., compared with 2,900,000 bbls., or 414,000 bbls. daily, for the week ended November 16.

Receipts from the Gulf showed a substantial increase, amounting to 2,301,000 bbls., or 329,000 bbls. a day. The daily average shows a gain of over 100,000 bbls. compared with the preceding week.

Receipts from California for the week are estimated at 151,000 bbls., a daily average of 22,000. California receipts have fallen off gradually during recent weeks, with the advent of additional West Texas and foreign oils.

Imports from Mexico were 428,000 bbls., or 61,000 bbls. a day, for the week ended November 23, while imports from Trinidad, Venezuela, Colombia and Peru, combined, aggregated 820,000 bbls., or a daily average of 117,000 bbls.

The imports from South America (including Trinidad) seem to be definitely established at a rate substantially above that of imports from Mexico. This is one of the outstanding features of the import situation during the year.

The following table shows estimated daily average receipts of crude and refined oil by water at Atlantic Coast ports for the last three weeks; also monthly record for the past 12 months (figures in barrels):

	Week Ended		
	Nov. 23	Nov. 16	Nov. 9
Gulf Coast	329,000	215,000	382,000
Pacific Coast	22,000	45,000	107,000
Mexico	61,000	41,000	61,000
South America	117,000	114,000	102,000
Total	529,000	415,000	652,000

Daily Averages by Months

1927:	Gulf	Pacific	Mexico	S. Am.	Total
Oct.	314,000	98,000	38,000	91,000	541,000
Sept.	336,000	97,000	69,000	99,000	601,000
Aug.	397,000	90,000	80,000	78,000	645,000
July	406,000	83,000	78,000	49,000	616,000
June	378,000	118,000	68,000	47,000	611,000
May	332,000	58,000	91,000	53,000	534,000
April	388,000	93,000	69,000	61,000	611,000
March	345,000	103,000	36,000	81,000	565,000
Feb.	379,000	89,000	40,000	48,000	556,000
Jan.	362,000	73,000	49,000	61,000	545,000
1926:					
Dec.	363,000	57,000	49,000	61,000	530,000
Nov.	335,000	62,000	56,000	40,000	493,000

The foregoing figures are based on the carrying capacity of incoming oil-laden tankers.

CALIFORNIA RECEIPTS AND PETROLEUM IMPORTS

Imports of crude and refined oils at principal United States ports for the week ended November 19 totaled 1,528,000 bbls., a daily average of 218,286 bbls., compared with 1,503,000 bbls., a daily average of 214,714 bbls., for the week ended November 12 and a daily average of 220,607 bbls. for the four weeks ended November 19.

Atlantic Coast Ports—	
Baltimore	297,000
Boston	98,000
New York	355,000
Philadelphia	251,000
Others	225,000
Total	1,226,000
Daily average	175,143
At Gulf Coast Ports—	
Galveston district	80,000
New Orleans and Baton Rouge	222,000
Porth Arthur and Sabine district	.....
Tampa	.....
Total	302,000
Daily average	43,143
At All United States Ports—	
Total	1,528,000
Daily average	218,286
Daily average four weeks ended	220,607

Receipts of California crude and refined oils at Atlantic and Gulf Coast ports for the week ended November 19 totaled 251,000 bbls., a daily average of 35,857 bbls., against 670,000 bbls., a daily average of 95,714 bbls. for the week ended November 12 and a daily average of 87,285 bbls. for the four weeks ended November 19.

At Atlantic Coast Ports—	
Baltimore	.....
Boston	.....
New York	251,000
Philadelphia	.....
Others	.....
Total	251,000
Daily average	35,857
At Gulf Coast Ports—	
Daily average	.....
Total Atlantic and Gulf Coast ports	251,000
Daily average	35,857
Daily average four weeks ended	87,285
Distribution of total California receipts is as follows:	
Crude	95,000
Gasoline	78,000
Gas oil	78,000
Fuel oil	.....
Total	251,000

Suggest New Standard for Gas Testing

Analytical Method Separates Natural Gas Into Actual Constituents. Describe Apparatus, Explain Advantages

By Lester O. Warner*

It has been stated that the "efficiency of an industry is not greater than the efficiency of its testing practice." This is doubly true when applied to the natural gasoline industry, an industry which is inherently dependent upon the results of its tests, dealing as it does in the "hidden values" occurring in an invisible medium—gas.

On an average, the constitution of natural gas is the same as it was when the industry began, but the character of the product has been changing continually. Viewed from this standpoint it is easier to justify "rule of thumb" methods. The pseudo relationship between specific gravity of the gas and the gasoline content, the per cent solubility in various oils and the variety of small scale absorption testing methods were of value at the time they were used but they are now obsolete, except in special cases.

Only a few years ago the Newton test was in its prime. New plants in the Signal Hill Field showed poor extraction measured by this test. Plants were continually changed and as the pressure in the wells dropped the plant efficiencies improved. What proportion of the indicated gasoline content was caused by new gasoline constituents? We can not say, for the test was empirical. During this same period the charcoal test was employed. It was found that more gasoline was shown to be present by this test than was being produced in the majority of plants and great changes were made until the plants approached the production indicated. However, even this test is empirical and the same procedure can not be used in every case to attain the desired or maximum results. It is not to be expected that the charcoal test can be made to give absolute results as it depends upon quantitatively condensing the gasoline fractions from the mixture of hydrocarbons, air and the carbon dioxide which is generated during the distillation. No empirical test has been found satisfactory in the study of variations in quality of gasoline and it is our opinion that distillation recovery alone is not a satisfactory index of stability.

The Objective

The object of low temperature fractionation is to eliminate as many variables as possible. Instead of merely separating the gas into a gasoline and a nongasoline fraction (the object of previous empirical tests), the properties of which are dependent upon the relative proportions of constituents which compose them, in fractionation the gas is resolved into its different components so far as is practical. It is then possible to observe the changes in properties which take place with a variation in the proportion of the constituents.

There are so many hundreds of hydrocabons in petroleum and so many are present in natural gas that even were they all separated the information would be of little practical value. It has been found that the properties of a mixture of hydrocarbons are influenced to a much greater extent by the lighter members than the heavier and, fortunately, it is easier to quantitatively separate the lighter constituents than the heavier. The following table gives the hydrocarbons which have been identified as occurring in natural gas in the order of their boiling points: Methane, ethane, propane, iso butane, normal butane and normal pentane.

Many of the earlier investigators reported the presence of unsaturated hydrocarbons in natural gas because a contraction in volume was observed upon treatment with fuming sulphuric acid. More recent work has shown saturated hydrocarbons will dissolve to an appreciable extent in fuming sulphuric acid and that unsaturated compounds do not occur. There are, however, aromatic and cyclic compounds but these all have higher boiling points and lower vapor pressures than pentane. Due to the increasing difficulties of separation and measurement of these higher boiling constituents it is customary to report the residue as a group consisting of pentane and heavier.

*Before California Natural Gasoline Association.

Historical Development

The development of low temperature fractionation has covered a number of years, and cannot be called new. Nearly all of the present fractionating apparatus is dependent upon the same principles used over 25 years ago. The theory will be discussed in more detail later. Apparatus for the analytical separation of hydrocarbons followed in design and principle the excellent work of Ramsey and Travers in separating the gases of the atmosphere.

Work in other countries, notably that of Erdman and Stoltzenberg in Germany (1910) and Lebeau and Damiens in France (1913) and many others extended the work of Ramsey to the separation of various hydrocarbons. In this country credit must be given to Burrell, Siebert and Robertson, United States Bureau of Mines (1915), for the first complete procedure for the analytical separation of natural gas into its constituents. The process was slow and tedious and was greatly improved upon by Shepherd and Porter, also United States Bureau of Mines (1920-21), who reported the previous method required from 36 to 48 hours of continuous operation. About this time the Carbide & Carbon Chemicals Corp. conducted research upon the characteristics of gasoline, using an apparatus the details of which have never been disclosed. The time required for their analysis has been reduced to a few hours.

At one of the early meetings before this organization the need of a more precise method of determining the gasoline content of natural gas was stressed. It is interesting to observe that since that time three of the largest producing and refining companies in California have developed low temperature fractionation systems and a fourth is using a low temperature charcoal fractionation system.

Sampling

Before considering the actual separation procedure the samples must be obtained from the plant, pipe line or other source. The problem of obtaining samples that accurately represent the material, whether gas, gasoline or oil, is as important as any other step, and too much care cannot be taken. The difficulties encountered can be appreciated only by those who have to solve these problems. Every change in temperature, pressure and even contact with rubber and water will change the composition to some extent. All connections should be as short as possible and thoroughly purged. In sampling gas, care must be taken that an oil spray is not carried into the sample container, which is best made of glass. When gas is collected over water the bottle should be purged, displacing the water as completely as possible, reducing the quantity of dissolved gases to a minimum. It is obvious that rich vapors which will condense upon the walls are most difficult to handle. Although the sample container may be heated in the laboratory before removing any gas, results are liable to be erratic. Gases of low gasoline content, which are difficult to test by other methods, are more easily handled and the sampling errors are minimized.

It is theoretically possible to make a gasoline balance through a plant but such a procedure is not practical. Plants are not arranged so that representative samples over the necessary time interval can be taken. Variations in inlet gas quality, leakage of vapors and heads of vapor all combine to reduce the reliability. Errors in gas and gasoline measurement further increase the errors of such a balance. The gasoline content of inlet gas can be determined best by adding the actual gasoline production to the amount found by analysis in the gas leaving the plant. In this way the error of only one meter measurement, gasoline measurement and sampling is introduced.

Equal care must be employed in handling and storing samples until the analysis is made, which may be delayed weeks.

Procedure

Since the actual designs of apparatus for fractional analysis differ considerably, the procedure will also vary. The procedure will be treated from theoretical considerations only in order not to disclose confidential information.

For the benefit of those unfamiliar with the properties of the lighter hydrocarbons at low temperatures, let us consider the following analogous experiment. A glass bulb of about 100 c.c. capacity which has previously been evacuated is filled with equal volumes of a gas which may be air and water vapor. At 100 degrees Centigrade the mixture would appear as a gas. The air may be compared to methane and water to ethane. As the bulk is cooled, more and more water will condense on the walls just as ethane will condense from a hydrocarbon mixture at the temperature of liquid air. At 0 degree Centigrade the quantity of water remaining as a vapor in the air is only a fraction of the total and the air may be pumped out until the vapor pressure of water is approached, after which the water would be evaporated. The water remaining contains dissolved air and likewise the ethane residue of a fractionation contains dissolved gases. It is obvious that by removing the gas at lower temperatures a more complete separation can be made.

The separation of the methane is not a true distillation and depends upon the temperature being so adjusted that no appreciable ethane distills off with the methane.

The sharpness with which two members of a hydrocarbon series can be separated by distillation is dependent largely upon the ratio of their vapor pressure at any particular temperature. From data of Burrell and Robertson the formulae for the relationship of log ratio to absolute temperature have been derived. They are as follows.

$$\text{Log R}\ \frac{C_2H_6}{C_3H_8} = -0.247 + \frac{152.3}{T}$$

and

$$\text{Log R}\ \frac{C_3H_8}{C_4H_{10}} = -0.221 + \frac{240.8}{T}$$

Similar ratios may be obtained for other mixtures if vapor pressure data are available. At temperatures such that the vapor pressures are in the order of a milimeter the ratio is 10 to 20, but at lower temperatures the ratios increase rapidly.

Separation of Propane

The separation of propane from normal butane is complicated by the presence of an isomeric form of butane. At atmospheric temperatures iso butane has properties between propane and butane but closer to those of butane. Ext. note —At low temperature approach propane.

No reliable data were available regarding the vapor pressure of pentane but the vapor pressure ratio of butane to pentane increases at lower temperatures.

The apparatus which is constructed entirely of glass consists of a gas buret, a series of distillation bulbs which can be cooled to the proper temperatures, a pressure gauge for low pressures, a gas transferring pump. Provision is made for the final measurement of the fractions.

The entire apparatus is evacuated before admitting the sample. The sample usually contains CO_2 or O_2 as these are removed in an Orsat apparatus to determine CO_2 and air content. The gas buret should be capable of measurement within one part in 500. If the buret is used at atmospheric pressure, corrections should be made for the deviations from Boyles law (ref. Burrell.) The sample after measurement is transferred into the bulbs for the purpose of separating the mixture into a series of approximately binary mixtures. This may be accomplished as described by Shepherd-Porter (100 cit.) These mixtures are then held successively at such temperatures that only one constituent (the lowest boiling) has an appreciable vapor pressure. This is the step in each separation which must be made at the lowest practical temperature, the time required for the removal of the constituents being the limiting factor rather than theoretical considerations. In other words, the separation should be made under conditions which permit the highest possible ratios of vapor pressure.

The measurement of pentane and heavier constituents at atmospheric pressure is not reliable and the methods employed by other operators are not known.

Proof of Accuracy

What proof is there that the fractions removed are pure compounds and that they are actually the constituents they are assumed to be? The mere fact that the total of the fractions is 100 per cent of the sample is in itself no proof. It only indicates accuracy in manipulation.

The cryogenic laboratory of the Bureau of Mines has used two methods for demonstrating the accuracy. One method based upon the combustion analysis is only moderately accurate, each constituent yielding carbon dioxide upon complete combustion in accordance with the chemical structure. The only assumption involved is that lighter and heavier impurities are not present in equal molecular proportions.

The other method employed was to make up a hypothetical gas mixture of carefully purified constituents in known proportions and analyze the mixture by the procedure described. The results obtained in this way checked the known composition within 0.1 per cent.

A method which lends itself to routine checking and has proved most satisfactory for testing the purity of separated components is described by Shepherd-Porter. It is "based on the fact that the vapor pressure of a pure substance does not change as the ratio of the liquid volume to the gas volume is varied."

Applications

Now that we have described at some length the problem itself, the theoretical considerations involved, and the general development of the apparatus for the separation of natural gas into its actual constituents, we will try to answer the question which has probably occurred to most of you: that is, "What is the practical value of this complicated and expensive analytical method?"

The method in its present state is not

a routine test and will not replace the charcoal method of determining gasoline content. For brevity, we will enumerate uses for this method which suggest themselves:

1. An umpire or referee test to be used to settle disputes.

2. A means of improving and standardizing empirical testing methods.

3. It may be used to compare and correlate results of empirical tests on gases and gasolines of different characteristics, whether from the same or different fields.

4. It lends itself to the control of exacting processes to which empirical tests cannot be applied, an outstanding example of which is the stabilizer.

5. It is the only logical method for determining the absolute efficiency of commercial equipment for which the industry spends millions of dollars annually.

6. It makes possible the study of the properties and characteristics of new mixtures of petroleum products and the development of new products with specific properties.

7. And data obtained from accurate analysis will be a guide to the design of more efficient equipment which will save for the industry many times the amount spent in research and development.

To summarize, the low temperature fractionation is a standard reference test in which the precision is always greater than the precision of commercial application. For all practical purposes, therefore, such an analysis may be safely considered as the ultimate and the development is capable of satisfying the most exacting demands of research.

The possibilities of such a tool are bound to be realized by the type of engineers found in the natural gasoline industry.

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3. Stoltzenberg, H.—Ber. Dent. Chem. Gesell. Jahrg. 43, Bd. 2, p. 1,708 (1910.)

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5. References are given by Shepherd, M., and Porter, F. Ind. Eng. Chem. 15, 1,143 (1925.)

6. Burrell, Siebert and Robertson, United States Bureau of Mines Tech. Paper 104.

7. Loc. cit.

8. Burrell, G., and Robertson, I. W.—United States Bureau of Mines Tech. Paper 142, p. 19.

9. Burrell, G.—Recovery of Natural Gasoline From Natural Gas, p. 96.

10. Shepherd & Porter—Ind. Eng. Chem. 15, 1,145, 1,146 (1023.)

ROCKY MOUNTAIN AREA

(Continued from Page 264)

while laying the Marias River crossing. At the point where the line crosses the river the banks are perpendicular and the pipe had to be welded on top of the bank and then slid down to the scow and lowered to its bed as the welders made up more joints. The bottom here is soft mud and it is expected that the three lines of the river crossing will sink of their own weight to a deep covering of mud.

All the pipe for the line is now on the right of way or on the cars on switches, waiting for the trucks to haul it out to the line. There are 26 cars of pipe at Great Falls and these represent the last shipments from the mills in the East. About 250 men are now active at the four points where the work is being done and in all except one part of the line, the crews are working out from camps. Near Conrad, the crews are living in the town and are hauled by trucks to work each night and morning.

At the rate the line is being laid, the engineers hope to have the gas turned in the line by the first of the year and service will be had immediately in the towns and cities the line will serve.

The three fires in the Sunburst Field were put out the past week without serious trouble. One outstanding fact of the fire at the Radigan-Hungerford well is the sudden increase in production of several wells close to this well during the time it was on fire. Some of the adjoining wells jumped up as high as 100 bbls. daily in production and wells that had been making water regularly suddenly started to make clean oil without any water while the Radigan well was on fire.

Operations During Week

Owing to the cold weather and heavy snows in Sunburst, no completions were made during the past week. The Dakota-Montana Oil Co.'s well, No. 11, is still holding up around 400 bbls. daily and the Radigan well that was on fire is swabbing now and will go on the pump about the first of the week. A 4-inch string of tubing will be set in this well.

In the new Bannatyne Field, the Bannatyne Oil Co., in Section 29-26-1, is drilling at 1,170 feet, and found the Red Beds at 1,020 feet. This location is about 2 miles north of the Genou discovery well but is finding the strata at the same levels.

ROCKY MOUNTAIN PRODUCTION
Runs From the Fields

Wyoming	
Salt Creek	38,480
Teapot	1,050
Bld Muddy	2,790
Grass Creek	2,660
Elk Basin	930
Greybull	20
Dutton Creek	20
Notches	170
Rock River	2,740
Rex Lake	130
Lance Creek	1,070
LaBarge	620
Mule Creek	620
Poison Spider	420
Hamilton	610
Osage	320
Lander	820
Pilot Butte	270
Ferris	50
Byron	60
Lost Soldier	2,810
Simpson Ridge	40
Total Wyoming	56,700
Montana	
Cat Creek	1,910
Lake Basin	150
Kevin-Sunburst	11,000
Total Montana	13,060
Colorado	
Florence	776
Moffat	1,172
Fort Collins	3,131
Walden	....
Iles Dome	800
Rangely	100
Tow Creek	431
Boulder	25
Total Colorado	6,435
New Mexico	
Rattlesnake	330
Hogback	270
Cap Rock	101
Table Mesa	....
Artesia	1,267
Total New Mexico	1,968
Total Rocky Mountain	78,163

GAS BIG FACTOR IN THE TEXAS PANHANDLE

(Continued from Page 48)

sand is the life of an oil field as well as a gas field. From our experience, we know that sand pressure or rock pressure is essential to the efficient operation of the gas or air lift. When the sand pressure is gone the lift no longer functions and with decrease in sand pressure the lift becomes increasingly difficult until the balance of intake and sand pressure becomes so delicate that continuous flowing is not efficient and periodic blowing is resorted to. When this stage is reached it is usually just as economical to put the well on the pump. Then even with the well on the pump a low pressure in the sand is a decided handicap and with the pressure gone the well becomes a "stripper," although much oil may still remain in the sand.

Recently Beecher and Parkhurst[3] have made experiments to show the effect of dissolved gas upon the viscosity and surface tension of crude oil. Their results showed that the amount of gas dissolved is directly proportional to the pressure, other things being equal. Also that the viscosity of crude oil is greatly reduced when oil contains gas in solution. The decrease in viscosity depends upon the amount of gas dissolved in the oil if other conditions are constant and an oil with high initial viscosity will show a greater relative decrease for a given amount of dissolved gas than one with a lower initial viscosity.

A similar result was found with regard to the effect of dissolved gas on surface tension. They state that "a large percentage of oil which present production methods fail to remove from the sands is held by capillarity. As the gas dissolved in the oil escapes, the surface tension is increased and likewise the capillary force which is a measure of surface tension. If this increase in surface tension could be prevented during the process of extracting the oil from the sands a greater volume of oil should be recovered."

Another function of the gas in producing oil is particularly applicable to the Panhandle. This is its ability to hold back the water. It is well known that the pressure in the oil, gas and water in the Panhandle was in equilibrium in the early days of the field. Removal of the gas and oil has disturbed this balance and caused the water to rise locally. Of course, the gas is expansible and the oil with dissolved gas is also somewhat expansible but the water is not expansible or compressible. However, with the maintenance of pressure at one point and the release of pressure at another such as happens when a well is drilled in the water will cone up at the well and by so doing cut off part of the oil sand. If pressures could be maintained or their decline retarded water coning would be retarded. Nearly all water troubles in the Panhandle are the result of coning off bottom water, hence, preservation of the gas will greatly reduce water troubles.

Saving the Gas

With approximately 1,000,000,000 cubic feet of gas available for the market and with an estimated daily wastage of 300,000,000 to 400,000,000 cubic feet it is incumbent upon oil operators to save gas wherever it is possible to do so. During the rush of early development in the field many wells were not cased through the gas pay and if the pipe was run it has been shown that many of these wells failed to shut off the gas. Most of it comes around the shoe of the gas string which is merely hanging in the hole. Other instances are known of the gas string being pulled up to allow more gas into the hole with the belief that in so doing more oil would be produced. It is true that if the oil is available that increased gas will mean increased oil production. However, it has also been shown that with the proper size tubing any amount of gas over 3,500 cubic feet per barrel of oil produced is not only unnecessary but detrimental to the production of oil. In other words, if a given size well in the Panhandle is properly tubed anything in excess of 3,500 cubic feet per barrel of oil produced will cause "blowing" of the gas which means that a part of the gas is replacing or bi-passing the oil which should be lifted from the hole. At any rate, there are many wells which might be repaired by lowering the casing or by using a packer or by cementing in such a way that the gas could be conserved and the oil produced without waste. We need make no statement here as to the importance of gas conservation to the gas producer. To him a loss of gas is a direct loss and a decrease in pressure means additional expense in marketing.

Many operators have contended that gas wastage could not be avoided while drilling through the gas pay. This is not strictly the case for it has been demonstrated in the Panhandle Field where the pressure of the gas is below normal it is possible to drill through the gas by balancing the water in the hole with the pressure of the gas in such a way that very little gas will be wasted. This method invented by N. O. Miller has been tried on several occasions and will work and in many cases will save time and money for the operator as well as saving the gas. It is recommended that this method be investigated and is found satmethod be investigated and if found satgas especially wherever big gas is encountered.

By the repairing of wells in the main producing areas it seems probable that the influx of gas from the surrounding territory will retard the decline of pressure appreciably. In addition to this it is suggested that residue gas which is not used might be returned to the gas sand in wells which are now dead. Although this suggestion may be regarded as untimely, the writer believes it will not be long until it may be necessary to resort to this method to restore the pressure and get out a fair proportion of the oil which still remains in the producing areas.

[3]A. I. M. E. Petroleum Development and Technology in 1926, pp. 51-63.

WATERS VICE PRESIDENT OF SMITH SEPARATOR CO.

The Smith Separator Co. of Tulsa, distributor of Fisher governors, Reed air filters, victaulic couplings, Waters gauge cocks, and the separator bearing its name, announces the election of M. F. Waters as vice president.

Mr. Waters has been general manager of the company for several years, and became identified with the concern in the early stages of its operations. Under his guidance the scope of the products handled by this company has extended and the sales have multiplied many times. He was placed in charge of the company at a time when its sales were limited and the employes numbered five. Today the company has 20 salesmen in the various parts of the Mid-Continent Field.

—Photo by Rivkin.
M. F. Waters

According to the company's announcement, the change in title will cause no revision of the organization's personnel, but is merely an expression of additional confidence in Mr. Waters.

COMMITTEE OF NINE MEETS DECEMBER 10

By Charles E. Kern

Washington Bureau, The Oil and Gas Journal

WASHINGTON, D. C., Nov. 26.—In order that the initial meeting of the committee of nine representing the Government, the oil industry and the American Bar Association for the study of legal phases of national oil conditions shall not conflict with the annual meeting of the American Petroleum Institute at Chicago, Secretary Hubert Work has postponed the date of meeting until 10 o'clock a. m., December 10. This meeting will be held in the office of Secretary Work in the Interior Department Building here.

On December 9, at 10 o'clock a. m., there will be a meeting here in suite 1206, National Press Building, of the committee representing the minerals section of the American Bar Association of which former Senator Chester I. Long is the chairman. At this meeting there will be elected three members of the American Bar Association committee to represent the Association on the committee of nine, the appointment of which was requested by Secretary Hubert Work.

REFINING AND MARKETING

GASOLINE CONSUMPTION SHOWS LARGE INCREASE

Gasoline consumption based on reports from 34 states experienced an exceptionally large increase over the corresponding month of last year. The increase amounted to 18.9 per cent. This was the largest monthly increase of the year. Florida was the only state whose September consumption this year was less than in September, 1926.

Another unusual feature of the September reports shows that the daily consumption in September was 2.4 per cent greater than the preceding month of August. Gasoline consumption in the 34 states for the nine months ending September 30 totaled 4,970,840,000 gallons compared to 4,464,317,000 gallons for the same period in 1926, and increase of 11.3 per cent.

Gasoline Consumption by States, September, 1927 and 1926

	Month of— Sept., 1927 Gallons	Sept., 1926 Gallons
Alabama	14,170,000	11,467,000
Arizona	4,068,000	2,846,000
Arkansas	11,641,000	9,379,000
Delaware	2,411,000	1,418,000
Florida	19,682,000	20,538,000
Georgia	17,361,000	15,550,000
Idaho	4,692,000	4,248,000
Indiana	34,703,000	32,222,000
Iowa	29,361,000	23,844,000
Kansas	28,307,000	22,569,000
Kentucky	12,288,000	10,216,000
Louisiana	13,666,000	12,323,000
Maine	9,513,000	8,366,000
Michigan	‡84,200,000	53,257,000
Minnesota	31,831,000	27,556,000
Missouri	31,266,000	29,359,000
Nebraska	16,908,000	13,954,000
New Hampshire	5,256,000	4,789,000
New Mexico	2,762,000	2,448,000
North Carolina	20,403,000	18,195,000
North Dakota	15,246,000	9,567,000
Ohio	75,108,000	66,408,000
Oklahoma	23,539,000	20,972,000
Oregon	13,029,000	11,332,000
Rhode Island	5,728,000	5,270,000
South Carolina	9,419,000	8,072,000
South Dakota	11,309,000	7,647,000
Texas	52,520,000	48,985,000
Utah	4,040,000	3,714,000
Virginia	16,414,000	14,009,000
Washington	19,341,000	17,465,000
West Virginia	11,188,000	9,418,000
Wisconsin	33,090,000	28,200,000
Wyoming	2,749,000	2,314,000
Total	687,209,000	577,917,000
Daily average	22,907,000	19,264,000
Increase over previous year:		
Amount	109,292,000	
Percentage	18.9%	
Connecticut		
Maryland		
Mississippi		
New Jersey	36,728,000	

‡Beginning September 4, Michigan tax became payable on inspections and not on sales as before.

	Quarter Ended— Sept. 30, 1927	Sept., 30, 1926
California	273,754,000	244,915,000
Montana	18,153,000	16,657,000
Pennsylvania	204,325,000	184,956,000
Tennessee	43,509,000	36,516,000

RAIL USE OF FUEL OIL

WASHINGTON, D. C., Nov. 26.—During September the average cost of fuel oil used by 172 Class 1 railways was 2.71 cents a gallon compared with 2.97 cents for the same month in 1926. The fuel oil included only what was used for road locomotives charged to operating expenses. During the nine months ended with September the railroads paid $42,733,613 for fuel oil and $189,209,596 for coal. In both instances the amount of fuel consumed was less than the consumption last year.

GASOLINE STOCKS GREATER

There was an increase in gasoline stocks of 83,000 bbls. during October, according to a report compiled by the American Petroleum Institute. This is the first increase in gasoline stocks since late in the spring. Kerosene stocks decreased 419,000 bbls. during October, according to the report.

Increases developed in stocks of all other refined products. The increase in gas and fuel oil stocks was 56,000 bbls., lubricating oil 9,000 bbls. and miscellaneous oils 97,000 bbls.

FORD CAR WILL ADD MATERIALLY TO GASOLINE DEMAND NEXT YEAR

The assurance of the past week that the Ford Motor Co. will have its new model cars available for general sale starting about the first of the year is interpreted in refining and marketing circles to mean that there will be an exceptionally large increase in gasoline demand the first half of 1928.

The curtailment in the sale of Ford cars starting early this year with a complete cessation of car production starting late in the summer no doubt has been reflected in both the export and domestic demand for gasoline. Those closely associated with the automobile industry agree that the decline of 636,536, or approximately 20 per cent, in the number of cars and trucks manufactured in the United States the first nine months of this year compared with the same period in 1926 is entirely due to decline in the Ford output.

The curtailment in the Ford output early in the year was partially offset by the increased number of cars manufactured by other companies. However, since August when the Ford company announced that it would discontinue the manufacture of the Model T type and would shortly place another type car on the market complaints have been heard that the action tended to slow up the sale of all the cheaper cars.

Prospective buyers are said to have postponed their purchases awaiting the new Ford car. With the new model announced it is expected that there will be a large increase in the sale of not only the Ford cars but also all other low-priced cars. Those who do not find the Ford model satisfactory for their use will now feel free to buy some other make of car.

The following table shows the total output of cars and trucks the first nine months of this year compared with the same period last year:

	1926	1927	1927 Decrease
January	316,091	349,607	*33,516
February	373,269	317,420	55,849
March	445,101	409,464	35,637
April	452,025	422,388	29,637
May	442,145	421,382	20,763
June	402,123	333,191	68,932
July	369,602	274,393	95,209
August	437,579	315,566	122,013
September	410,851	268,839	142,012
Total	3,648,786	3,012,250	636,536

*Increase.

It will be noted that there was a decrease in output every month except January. Since the Ford plant was completely shut down so far as new car production was concerned the decrease has been exceptionally large, the total for August and September being 264,000 under the same two months of 1926.

Final figures for October and November are not available at this time. However, production no doubt was relatively low so that the decline for the 11 months will be between 800,000 and 900,000 cars and trucks.

Effect on Gasoline

The fact that the new car production this year has been less than expected has had its effect on the demand for gasoline. With 900,000 more cars and trucks manufactured it is conservatively estimated that the demand for gasoline this year would have been 6,000,000 bbls. or approximately 250,000,000 gallons greater. While this extra demand would not have cured the overproduction evil with which the industry has been suffering this year it would have removed a substantial quantity of distress material.

The following table shows the increase in gasoline consumption for the years 1927, 1926 and 1925. Figures given in thousands of barrels:

Month—	Increase— 1927 Over 1926	1926 Over 1925
January	306	3,196
February	2,426	2,604
March	3,162	4,412
April	2,523	1,835
May	2,366	3,754
June	3,996	3,079
July	5,032	2,429
August	2,867	6,735
September	5,480	3,103
Total	28,158	31,147

This table shows that the actual increase in domestic demand of 1926 over 1925 was greater than it was in 1927 over 1926. The percentage increase based on the figures for the first nine months of this year was a little over 14 per cent. This would have been increased to 17 per cent, however, had the same number of new automobiles been placed in service as there were in 1926.

It is also expected that there will be some increase in the export demand for gasoline next year. The export outlet has been the big disappointment of the year. The demand so far this year has been practically the same as last year despite the fact that the 1926 gasoline exports were more than 40 per cent greater than in 1925. The Ford Motor Co. has been the leading exporter of automobiles and it is stated in automobile circles that the company plans to extend its foreign business during the coming year.

The export situation this year is explained as being largely due to the increased capacity of foreign refineries which have furnished a greater percentage of the foreign demand. A large increase in export shipments of automobiles, however, should have had some effect on the world market for gasoline.

POSTPONE RATE INCREASE

The new rates authorized in a recent decision of the Interstate Commerce Commission from Mid-Continent refinery centers to consuming points in Western Trunk Line territory east of the Mississippi River will not become effective until February 15. At the request of the railroads concerned the date on which the rates were to become effective was postponed from January 2.

The Interstate Commerce Commission decision changes the present rate grouping so that all of Central Kansas and Oklahoma are in one group. The rates from these points to the Western Trunk Line territory were advanced.

FIRST EXPORT ORDER

The first export order for Naturaline, a product of natural gasoline recently placed on the market by the Chestnut & Smith Corp. of Tulsa, was shipped from the corporation's plants during the past week. The gasoline will first go to a Gulf Coast terminal where it will be shipped by boat to the foreign buyer.

The first export order was placed as a result of an investigation of the foreign market by D. E. Buchanan, vice president of the Chestnut & Smith Corp. Mr. Buchanan spent several months in European countries during the past year. It is understood that additional export business will be placed by the corporation in the near future.

EXPORTS OF CRUDE AND REFINED OILS INCREASE

Exports of crude petroleum and refined oils were exceptionally large in October according to a report just issued by the Bureau of Foreign and Domestic Commerce. The crude exports which totaled 1,539,249 bbls. in October were greater than any other month this year. The total of 10,765,249 bbls. for refined oils also established a record for the year.

The low prices which prevail for crude oil and the refined products exported are reflected in the total value of the exports. The value of the October exports of refined oils was less than during the same month last year, although the quantity exported was approximately 60 per cent greater.

The kerosene exports were especially heavy during October, the total of 2,193,120 bbls being greater than any month since August, 1926. The following table shows the October exports for both 1927 and 1926.

		1926	1927
Crude petroleum	Bbls.	1,010,084	1,539,249
	$	2,130,680	2,391,273
Total refined petroleum	Bbls.	6,978,380	10,765,249
	$	35,728,903	35,245,532
Gasoline, naphtha, & other light prod.	Bbls.	2,703,396	3,333,941
	$	17,504,588	16,101,172
Illuminating oil	Bbls.	1,883,534	2,193,120
	$	9,452,136	7,888,046
Gas and fuel oil	Bbls.	1,687,785	3,902,647
	$	2,326,934	4,380,037
Lubricating oil	Bbls.	694,478	825,946
	$	6,302,458	6,711,455
Other refined petroleum	Bbls.	9,277	9,595
	$	142,787	164,822
Paraffin wax	Lbs.	28,744,096	28,341,746
	$	1,632,003	1,116,001

VICKERS PETROLEUM CO. BUYS DENVER STATIONS

DENVER, Colo., Nov. 29. — Vickers Petroleum Co., the vehicle through which the Standard Oil Co. of Indiana is expected to enter the retail marketing business in the Rocky Mountain district, has purchased 14 service stations in Denver from the Paramount Lubricants Co. to be added to the chain of stations previously acquired. This brings the total number of wholesale and retail outlets in Colorado, and adjoining states up to approximately 150 representing an investment of close to $1,000,000.

Considerable work is in progress revamping, improving and extending these stations and it is considered a question of only a few weeks until products marketed under the Standard of Indiana brands will be offered the public.

PENNSYLVANIA MARKET

OIL CITY, Pa., Nov. 26.—In the Pennsylvania refined district during the past week gasoline was stronger with no fundamental reason for the strength. Better prices in the East for motor fuel is given as a reason for the improvement. There was not much change in the kerosene situation which is very satisfactory for this period of the year. Fuel oil is in fair condition but not very good. Wax is inclined to be a trifle soft without much buying, the prices remaining unchanged despite some shading. There is a good demand for neutrals. Bright stocks are not as low in price as they have been for some of the distress material is now off the market. The movement of cylinder stocks is fair with prices unchanged.

ADOPTS A NEW NAME

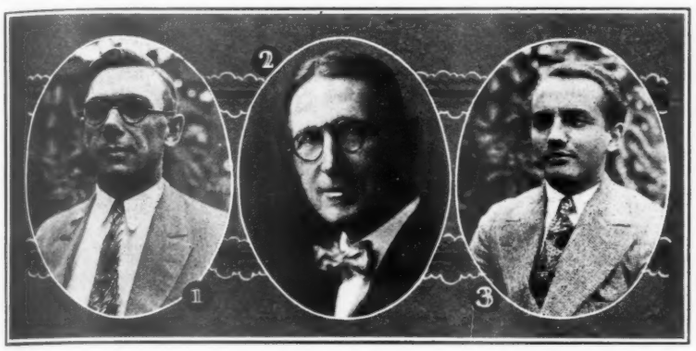
CHICAGO, Nov. 26.—The General Oil Service Corp. of this city has changed its name to the Grant Oil Service Corp. The head of the business has been and is E. E. Grant who was secretary of the old Independent Oil Men's Association for many years and is well known to the trade. The address is 844 Rush Street.

Brief Items for Plant Operators

Plant Operators Organize Company On Western Coast

A new firm entering the manufacture of absorption plant and refinery equipment is the Engineering, Research and Equipment Co., 655 Roosevelt Building, Los Angeles.

The organizers are I. B. Funk, consulting engineer; J. E. Kobernik, formerly general manager of the Newton Process Manufacturing Co., and Paul Raigorodsky, formerly efficiency engineer for Newton Process Manufacturing Co.



1—J. E. Kobernik. 2—I. B. Funk. 3—P. M. Raigorodsky.

I. B. Funk is vice president of the California Natural Gasoline Association, and has been connected with the petroleum industry in various capacities most of the time for 25 years. During seven and one-half years with the Union Oil Co. of California, he had charge for six years of the research work pertaining to gasoline plants and field operations. Since leaving the Union Oil Co. in 1926, he has been engaged in consulting engineering practice.

J. E. Kobernik has had a wide experience in manufacturing. He was with the New York Central Shops as layer-out, and later as boiler inspector. Going to California during the World War, he entered the employ of the General Petroleum Corp. in charge of shops; then to the Standard Oil Co. in charge of shops. In 1922 he started the Santa Fe Springs Welding & Boiler Shop, which later was incorporated as the Newton Process Manufacturing Co. Mr. Kobernik had charge of the design and manufacture of the Newton equipment, and resigned as general manager to become identified with the Engineering, Research and Equipment Co. as general manager.

P. M. Raigorodsky served two years in the World War and is a United States reserve officer. His training was at the University of Prague and the University of Texas. He has had a wide range of experience in the supervision and operation of gasoline absorption plants and efficiency work.

Equipment will be manufactured in Los Angeles and Tulsa.

AVIATION MENACES TANKS

Great Falls, Mont., has a problem in its new air mail field, this field consists of 22 acres located just south of the American Refining Co.'s plant and the danger of an airplane dropping on an oil tank or a battery of stills was overlooked. It is now pointed out that should an aviator make a miscalculation in landing and happen to hit a tank of naphtha or a battery of stills while in operation, the resultant fire would be disastrous to both the airman and the refinery.

NEWEST CROSS UNIT STARTED AT OKMULGEE

The Barnsdall Refineries, Inc., of Tulsa has started operating a new Cross cracking unit at its Okmulgee, Okla. refinery. The unit incorporates practically all of the latest developments in the design of the Cross process. The unit operates with gas oil as charging stock.

The unit is operated as a 1,000-bbl. unit. The rating, however, is based on the fresh oil charge the total capacity considering both fresh and recycle stock being between 3,000 and 4,000 bbls. daily.

NEED ANTIKNOCK AND VOLATILITY IN GASOLINE FOR AIRCRAFT ENGINE

By E. T. Jones*
Chief Engineer, Wright Aeronautical Corp.

The performance of an aircraft engine is so closely related to the properties of the fuel used that it is necessary for the engine manufacturer to specify a lowest quality of fuel which may be used satisfactorily in an engine. The engine operator frequently finds this restriction troublesome as in certain localities it is difficult to secure fuel of the desired quality and there is no simple quality test which can be readily applied at the time the fuel is purchased. The operator who has experienced these difficulties is apt to inquire why the engine manufacturer does not design his engine to run satisfactorily on ordinary commercial automobile gasoline, thus avoiding the constant danger and inconvenience involved in so constructing the engine that serious damage is apt to occur if an improper grade of fuel is used. His attitude on this point is probably based on a failure to appreciate how great a sacrifice in engine performance would be necessary in order to meet his desires.

Continuous Detonation

In the first place, it might be pointed out that the average automobile engine falls far short of satisfactory full throttle operation when using the poorer qualities of motor gasoline on the market. In the majority of automobile engines violent detonation arises if the engine is forced to operate at heavier loads for any appreciable length of time. With the relatively heavy construction employed in the automobile engine this detonation, while annoying, is not particularly dangerous.

On the other hand, with the lighter construction employed in aircraft engines continuous detonation is certain to be followed by disastrous results. Use of the lower grades of fuel also leads to distribution of troubles tending to make the engine run unevenly and to eliminate this trouble complication heating devices are required which both increase the weight of the engine and reduce the maximum power output. To sum the matter up briefly it may safely be stated that if the engine manufacturer were to design his engine to operate smoothly and safely on the poorer grades of motor gasoline, he would find the power output from a given size engine reduced by at least 30 per cent and it is probable that the unit weight would be increased by an even larger percentage.

The government specifications makes no reference to the antiknock qualities of the fuel and unfortunately this property is not covered by any of the tests specified. We thus find ourselves in a position where we have no adequate specification to cover one of the most important properties of the fuel. This situation arises from the fact that as yet no satisfactory laboratory test for definitely fixing the detonation characteristics of the fuel has been devised. A great deal of research work is being done along these lines and it seems safe to predict that in the near future a satisfactory solution of this difficulty will be developed. At present the only reliable method consists in comparing the performance of the given fuel in a given engine with the performance of some standard fuel in the same engine. Unfortunately the type and the condition of the engine seriously influence the results of such tests, hence it is impossible to devise a standard test which can be duplicated in different laboratories utilizing different engines.

Volatility Important

In spite of the fact that we are at present unable to definitely specify the antiknock properties of a fuel, there is a great deal of information available regarding this property which generally enables us to secure fuels which are satisfactory in this respect. In the first place, regardless of the type of crude from which the fuel is distilled, there is a general tendency for the antiknock value to improve as the boiling point is lowered; thus in general the so-called high test gasolines are superior in antiknock value to the low test gasolines. In the second place the type of crude from which the fuel is manufactured has a pronounced influence on its antiknock qualities. With these facts in mind the operator has only to assure himself that the distillation range meets the requirements of the government specification for domestic aviation gasoline. In placing the Wright "Whirlwind" engine on the commercial market it was the intention to permit the widest possible selection of fuels, hence the design was so adjusted that the engine would run satisfactorily on any American fuel meeting the government specifications for domestic aviation gasoline.

Antiknock Fuels

The tendency of an engine is to detonate not only on the grade of fuel but to a considerable extent upon the quality of the mixture, rich mixtures being quite efficient in suppressing detonation. This makes it possible for the operator to

(Continued on Page 284)

*Part of article appearing in Aviation.

AMONG THE TECHNICAL MEN

In a quarter century of practical refinery experience, J. P. Gillen, superintendent of the Deepwater Oil Refineries, Inc., of Houston, Tex., has been employed by some of the leading refinery companies of the country and in four distinct refining districts, namely, Gulf Coast, Eastern, Middle Western and Mid-Continent.

J. P. Gillen

Mr. Gillen has been with Deepwater since May, 1920, coming to this company as its first and only superintendent since the plant was started. His connections with the refining industry date back to 1902 when he was employed in the Prat Works at Long Island City of the Standard Oil Co. of New York.

After leaving the Standard Oil Co. in 1904, Mr. Gillen was placed in charge of the manufacture of lubricating oils for the Gulf Refining Co., at Port Arthur, Tex., which position he held three years. In 1910 he went to work for The Texas Company as superintendent of the lubricating oil division at its Marcus Hook, Pa., refinery. Leaving there he returned to the Gulf Coast as superintendent of the Texas City plant of the Pierce Petroleum Corp., and then went to Yale, Okla., in 1917, as superintendent of the Southern Oil Corp.

Following service with the Southern Oil Corp., he again returned to the Gulf Coast, this time with the Sinclair Refining Co., as superintendent of refineries of the southern division. It was while he was in this position that Sinclair's refinery at Sinco was started. From Sinclair he went with Deepwater.

Mr. Gillen is a native of New York and after his earlier education he studied chemistry both at Pratt Institute and Cooper Union. He is a member of the American Society of Chemical Engineers.

REFINERY AND CRUDE PRICES

Quotations on Principal Refined Products and Crude Petroleum Markets in All the American Oil Fields

GASOLINE AND NAPHTHA

	Nov. 29		Nov. 22		Nov. 15	
OKLAHOMA (Group 3)—						
50-52 450 endpoint	.05¾		.05¾	.06	.05¾	.06
56-58 450 endpoint	.05¾		.05¾		.05¾	
58-60 450 endpoint	.05¾		.05¾		.05¾	
58-60 437 endpoint (U. S. Motor)	.06	.06⅛	.06	.06¼	.06	.06¼
60-62 400 endpoint	.06½	.06⅝	.06½	.06⅝	.06½	.06⅝
64-66 375 endpoint	.06¾	.07	.06¾	.07	.06¾	.07
68-70 360 endpoint	.07⅛	.07¼	.07⅛	.07¼	.07⅛	.07¼
64-66 437 endpoint (blend)	.06	.06¼	.06	.06¼	.06	.06¼
KANSAS—						
58-60 437 endpoint (U. S. Motor)	.06¼	.06⅜	.06¼	.06⅜	.06¼	.06⅜
NORTH TEXAS—						
56-58 450 endpoint	.05¾		.05¾		.05¾	
58-60 450 endpoint	.05¾	.05⅞	.05¾	.05⅞	.05¾	.05⅞
58-60 437 endpoint (U. S. Motor)	.06	.06⅛	.06	.06⅛	.06	.06⅛
60-62 400 endpoint	.06½		.06½		.06½	
64-66 390 endpoint	.06⅝		.06⅝		.06⅝	
64-66 375 endpoint	.06¾	.07	.06¾	.07	.06¾	.07
68-70 360 endpoint	.07		.07		.07	
64-66 437 endpoint (blend)	.06¼		.06¼		.06¼	
NORTH LOUISIANA—						
58-60 437 endpoint (U. S. Motor)	.06½		.06½		.06½	
ARKANSAS—						
58-60 437 endpoint (U. S. Motor)	.06½		.06½		.06½	
PENNSYLVANIA—						
52-54 Naphtha	.07¾	.08	.07⅞	.07½	.07⅞	.07½
54-56 Naphtha	.07¾	.08	.07⅞	.08	.07⅞	.08
58-60 Gasoline	.08	.08¼	.07⅞	.08	.07⅞	.08
60 Gasoline	.08¾	.09	.08¼	.08½	.08½	.08¾
62 Gasoline	.09⅛	.09¼	.09⅛	.09¼	.09⅛	.09¼
64 Gasoline	.09¼	.09½	.09¼	.09½	.09¼	.09½
CALIFORNIA—						
58-60 437 endpoint (U. S. Motor) domestic	.08	.08½	.08	.08½	.08	.08½
CHICAGO DISTRICT (Based on Group 3)—						
50-52 450 endpoint (Naphtha)	.05⅞	.06	.06		.05⅞	.06
56-58 450 endpoint	.05⅞		.05⅞	.06	.05⅞	.06
58-60 437 endpoint (U. S. Motor)	.06	.06¼	.06	.06¼	.06	.06¼
60-62 400 endpoint	.06½	.06⅝	.06½	.06⅝	.06½	.06⅝
64-66 375 endpoint	.06⅞	.07	.07	.07⅛	.07	.07⅛
68-70 360 endpoint	.07¼	.07⅜	.07¼	.07⅜	.07¼	.07⅜
64-66 437 endpoint (blend)	.06⅛	.06¼	.06¼		.06¼	

NATURAL GASOLINE

	Nov. 29		Nov. 22		Nov. 15	
OKLAHOMA (Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.05¾		.05¾		.05¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½		.05½	.05⅝	.05¾	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼		.05¼		.05½	.05⅝
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05⅛	.05¼	.05½	
Grade C, 80-92, 375 e.p., rec. 78%	.05		.05		.05½	
NORTH TEXAS—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.05¾		.05¾		.05¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½		.05½		.05¾	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼		.05¼		.05½	.05⅝
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05¼		.05½	
Grade C, 80-92, 375 e.p., rec. 78%	.05		.05		.05½	
NORTH LOUISIANA—						
Grade AA, 80-87, 375 e.p., rec. 90%	.06		.06		.06	
Grade BB, 84-92, 375 e.p., rec. 85%	.05⅞		.05⅞		.05⅞	
Grade C, 80-92, 375 e.p., rec. 78%	.05½		.05½		.05½	
CALIFORNIA—						
75-85, 375, 390 endpoint	.09	.09½	.09	.09½	.09	.09½
CHICAGO DISTRICT (Based on Group 3)—						
Grade A, 72-79.9, 375 e.p., rec. 90%	.05¾		.05¾		.05¾	
Grade AA, 80-87.9, 375 e.p., rec. 90%	.05½		.05½		.05¾	
Grade B, 76-83.9, 375 e.p., rec. 85%	.05¼		.05¼		.05½	
Grade BB, 84-92, 375 e.p., rec. 85%	.05¼		.05¼		.05½	
Grade C, 80-90, 375 e.p., rec. 78%	.05		.05		.05½	

Note: All natural gasoline, except California, is noncorrosive.

BURNING OIL

	Nov. 29		Nov. 22		Nov. 15	
KANSAS—						
41-43 water white Kerosene	.04¾	.05	.04¾	.05	.04¾	.05
OKLAHOMA (Group 3)—						
41-43 water white Kerosene	.04½	.04⅝	.04½	.04¾	.04½	.04¾
42-44 water white Kerosene	.05	.05⅛	.05	.05⅛	.05	.05⅛
NORTH LOUISIANA—						
41-43 prime white Kerosene	.05	.05¼	.05	.05¼	.05	.05¼
NORTH TEXAS—						
41-43 water white Kerosene	.04½	.05⅝	.04½	.04⅝	.04⅝	
40-42 water white Kerosene	.04¼	.04½	.04¼	.04½	.04⅜	.04½
ARKANSAS—						
41-43 water white Kerosene	.05	.05¼	.05	.05¼	.05	.05¼
PENNSYLVANIA—						
43 Kerosene prime white	.06⅜	.06¾	.06¼	.06½	.06¼	.06½
45 Kerosene water white	.06½	.06¾	.06½	.06¾	.06½	.06¾
46 Kerosene water white	.06¾	.07	.06¾	.07	.06¾	.07
47 Kerosene water white	.07	.07¼	.07	.07¼	.07	.07¼
300 Mineral Seal	.07¼	.07½	.07¼	.07½	.07¼	.07½
CALIFORNIA—						
38-40 water white Kero. (high burning test)	.05½	.06	.05½	.06	.05½	.06
Engine distillate, 43-45, 445 endpoint	.07	.07¾	.07	.07¾	.07	.07¾
Engine distillate, 42-44 480 endpoint	.06¾	.07	.06¾	.07	.06¾	.07
CHICAGO DISTRICT (Based on Group 3)—						
41-43 water white Kerosene	.04½	.04⅝	.04½	.04¾	.04½	.04¾
42-44 water white Kerosene	.04⅞	.05	.05		.05	

FUEL OILS

	Nov. 29		Nov. 22		Nov. 15	
KANSAS—						
22-26 Fuel Oil	.80	.85	.80	.85	.82½	.87½
18-22 Fuel Oil	.80		.80		.80	.82½
32-36 Gas Oil	.02½		.02½		.02⅝	
38-40 Distillate	.03¼	.03⅜	.03¼	.03⅜	.03¼	.03⅜
OKLAHOMA (Group 3)—						
Below 18 Fuel Oil	.70	.75	.70	.75	.72½	.75
18-22 Fuel Oil	.75	.80	.75	.80	.77½	.80
22-26 Fuel Oil	.80	.82½	.80	.82½	.80	.82½
24-26 Fuel Oil	.82½	.85	.82½	.85	.82½	.85
26-30 Fuel Oil	.87½		.87½		.87½	
28-30 Fuel Oil	.92½	.95	.92½	.95	.92½	.95
32-36 Gas Oil (dark)	.02⅜	.02½	.02⅜	.02½	.02½	
32-36 Gas Oil (straw overhead)	.02½		.02½		.02⅝	
36-38 Distillate	.03	.03⅛	.03	.03⅛	.03	.03⅛
38-40 Straw Distillate	.03⅛	.03¼	.03⅛	.03¼	.03⅛	.03¼
NORTH TEXAS—						
24-26 Fuel Oil (sellers' cars)	.80	.82½	.80	.82½	.80	.82½
32-36 Gas Oil (straw)	.02¼	.02½	.02¼	.02½	.02¼	.02½
38-40 Straw Distillate	.03	.03⅛	.03	.03⅛	.03	.03⅛
NORTH LOUISIANA—						
18-20 Fuel Oil	1.00		.90	1.00	.90	1.00
32-36 Gas Oil	.03	.03¼	.03	.03¼	.03	.03¼
ARKANSAS—						
36-38 Distillate	.03¼	.03½	.03¼	.03½	.03¼	.03½
32-36 Gas Oil (straw)	.03	.03¼	.03	.03¼	.03	.03¼
16-20 Refinery Fuel Oil	.95	1.00	.90	1.00	.90	1.00
GULF COAST (South Texas)						
Gas Oil	.03⅞	.04	.03⅞	.04	.03⅞	.04
Fuel Oil	1.25	1.30	1.25	1.30	1.30	1.35
PENNSYLVANIA—						
30-34 Fuel Oil	.04¼	.04½	.04¼	.04½	.04¼	.04½
36-40 Fuel Oil	.04⅜	.04⅝	.04⅜	.04⅝	.04⅜	.04⅝
CALIFORNIA—						
33-36 Distillate	.03½	.03¾	.03½	.03¾	.03½	.03¾
27-32 Distillate	.02¾	.03¼	.02¾	.03¼	.02¾	.03¼
*15-20 Fuel Oil, Bunkers (at tide water)	1.00		1.00		1.00	
15-20 Fuel Oil (cargo lots)	.90		.90		.90	
27 plus Diesel	1.15	1.19	1.15	1.19	1.15	1.19
CHICAGO DISTRICT (Based on Group 3)—						
24-26 Fuel Oil (sellers' cars) Group 3	.80	.82½	.82½	.85	.80	.85
22-26 Fuel Oil (sellers' cars) Group 3	.77½	.80	.80	.82½	.77½	.82½
18-22 (Group 3)	.75	.77½	.75	.80	.75	.77½
16-20 Smackover	.90	.95	1.00	1.02½	1.00	1.02½
32-36 Gas Oil (zero)	.02⅝	.03	.02¾	.03¼	.02⅝	.03⅛
32-36 Gas Oil (industrial)	.02⅜	.02⅝	.02½	.02¾	.02½	.02⅝
36-38 Distillate	.03	.03¼	.03⅛	.03¼	.03	.03⅛
38-40 Straw Distillate	.03¼	.03⅝	.03¼	.03⅜	.03⅛	.03⅜

*Bunkers.

LUBRICATING OIL AND WAX

	Nov. 29		Nov. 22		Nov. 15	
OKLAHOMA (Group 3)—						
100 vis., 2 color, 20-25 cold test	.06¼	.06½	.06¼	.06½	.06¼	.06½
100 vis., 3 color, 20-25 cold test	.06	.06½	.06	.06¼	.06	.06¼
150 vis., 3 color, 20-25 cold test	.08¼	.08½	.08¼	.08½	.08¼	.08½
150 vis., 4 color, 20-25 cold test	.08	.08¼	.08	.08¼	.08	.08¼
180 vis., 3 color, 23-28 cold test	.09⅜	.10	.09⅜	.10	.09⅜	.10
180 vis., 4 color, 23-28 cold test	.09¼	.09¾	.09¼	.09¾	.09¼	.09¾
180 vis., 5 color, 23-28 cold test	.09⅛	.09½	.09⅛	.09½	.09⅛	.09½
200 vis., 3 color, 23-28 cold test	.09½	.10¼	.09½	.10¼	.09½	.10¼
200 vis., 4 color, 23-28 cold test	.09⅜	.10¼	.09⅜	.10¼	.09⅜	.10¼
200 vis., 5 color, 23-28 cold test	.09¼	.10	.09¼	.10	.09¼	.10
240 vis., 3 color, 25-30 cold test	.13⅜	.14	.13¾	.14	.13¾	.14
240 vis., 4 color, 25-30 cold test	.13¼	.13½	.13¼	.13½	.13¼	.13½
240 vis., 5 color, 25-30 cold test	.12¼	.12½	.12¼	.12½	.12¼	.12½
280 vis., 3 color, 25-30 cold test	.15½	.16	.15½	.16	.15½	.16
280 vis., 4 color, 25-30 cold test	.15	.15½	.15	.15½	.15	.15½
280 vis., 5 color, 25-30 cold test	.14	.14½	.14	.14½	.14	.14½
Cylinder Stocks:						
600, steam refined, light green	.08	.09½	.08	.09½	.08	.09½
600, steam refined, dark green	.07	.07½	.07	.07½	.07	.07½
190-200 vis. @ 210 Bright Stock	.30	.32	.30	.32	.30	.32
150-160 vis. @ 210 Bright Stock	.24	.25	.24	.25	.24	.25
Waxes:						
124-126 White Crude Scale Wax	.02⅝		.02⅝		.02⅝	
PENNSYLVANIA—						
34 Neutral	.07½	.07¾	.07½	.08	.07½	.08
34 Sundebloom	.07¾	.08	.08¾	.09	.08¾	.09
36 Miners' Neutral	.07½	.07¾	.07¾	.08	.07¾	.08
150, 3 color	.26½	.27	.27¼	.27¾	.27¼	.27¾
180, 3 color	.31	.31½	.31	.31½	.31	.31½
200, 3 color	.32	.32½	.32	.32½	.32½	.33
220, 3 color	.34½	.35	.36	.36½	.36	.36½
600, steam refined	.09¼	.09¾	.10¼	.10½	.10¼	.10½
635, steam refined	.10½	.11	.11	.11½	.11	.11½
650, steam refined	.11¼	.11¾	.12	.12½	.12	.12½
600, Pennsylvania flash	.15	.16	.17	.17½	.17	.17½
*550, E filtered	.15¾	.16	.15¾	.16	.15¾	.16
*600, E filtered	.17	.17½	.17	.17½	.17	.17½
600, E filtered	.15½	.16	.16	.16½	.16	.16½
600, D filtered	.24½	.25	.25½	.26	.25½	.26
550, E filtered	.15½	.16	.17½	.18	.17½	.18
550, D filtered	.21½	.22	.21½	.22	.21½	.22
Pennsylvania Bright Stock	.28	.29	.29	.30	.29	.30
†122-124 White Crude Scale Wax	.02⅞	.03	.03	.03⅛	.03	.03⅛
†122-124 White Crude Scale Wax	.03		.03⅛	.03¼	.03⅛	.03¼

*At Warren, Pa. †At New York City.

GULF COAST (South Texas)—						
No. 2 color, 100 vis., pale oil	.06¼	.07	.06	.06½	.06	.06½
No. 3 color, 200 vis., pale oil	.08½	.09½	.08½	.09	.08½	.09
No. 3 color, 300 vis., pale oil	.09½	.10½	.09½	.10½	.09½	.10½
No. 3½ color, 500 vis., pale oil	.11½	.12	.11½	.12	.11½	.12
No. 4 color, 750 vis., pale oil	.14	.15	.14½	.15	.14½	.15
No. 5 to 6 color, 200 vis., red oil	.07½	.08	.07	.07½	.07	.07½
No. 5 to 6 color, 300 vis., red oil	.08½	.09	.08½	.09	.08½	.09
No. 5 to 6 color, 500 vis., red oil	.09½	.10½	.09½	.10	.09½	.10
No. 5 to 6 color, 750 vis., red oil	.12½	.13	.12½	.13	.12½	.13
No. 2 color, 200 vis., pale filtered	.11½	.13	.11½	.13	.11½	.13
No. 2 color, 300 vis., pale filtered	.12	.13	.12	.13	.12	.13

REFINERY AND CRUDE PRICES

Quotations on Principal Refined Products and Crude Petroleum Markets in All the American Oil Fields

No. 2½ color, 500 vis., pale filtered	.12¼	.13	.12¼	.13	.12¼	.13
No. 2½ color, 750 vis., pale filtered	.17	.18	.17	.18	.17	.18
CALIFORNIA—						
130 vis., 2½-3 color	.09	.10	.09	.10	.09	.10
200 vis., 2½-3 color	.10	.10½	.10	.10½	.10	.10½
300 vis., 3 -3½ color	.10½	.11	.10½	.11	.10½	.11
350 vis., 3½-4 color	.11	.12	.11	.12	.11	.12
400 vis., 3½-4 color	.13	.14	.13	.14	.13	.14
Red Neutral:						
200 vis., 4½-5 color	.08½	.09	.08½	.09	.08½	.09
300 vis., 5 -6 color	.09	.09½	.09	.09½	.09	.09½
400 vis., 5 -6 color	.11	.11½	.11	.11½	.11	.11½
500 vis., 4½-5 color	.11¼	.12	.11¼	.12	.11¼	.12
500 vis., 5 -6½ color	.11	.11½	.11	.11½	.11	.11½
600 vis., 6 plus color	.12	.12½	.12	.12½	.12	.12½

Note: Bright stocks are not manufactured commercially on the Pacific Coast.

NEW YORK (BAYONNE) REFINERY PRICES

	Nov. 29	Nov. 22	Nov. 15
Gasoline, U. S. Motor, 58-60 437	.08¼	.08¼	.08 .08¼
Kerosene, water white, 41-43	.07½	.07½	.07½
*Fuel Oil, bunker "C," 14-16, per bbl.	1.40	1.40	1.45
*Fuel Oil, Diesel, 28-30, per bbl.	2.10	2.10	2.10
Gas Oil, 28 plus	.05½	.05½	.05½
25 pale Paraffin Oil	.12	.12	.12
28 pale Paraffin Oil	.07¼	.07¼	.07¼
285 red Paraffin Oil	.11½	.11½	.11½
250 red Paraffin Oil	.10½	.10½	.10½
225 red Paraffin Oil	.10	.10	.10
200 red Paraffin Oil	.09½	.09½	.09½
Refined Wax:			
120-122 a.m.p., per lb.	.03⅞	.03⅞	.04
125-127 a.m.p., per lb.	.04	.04	.04¼
130-132 a.m.p., per lb.	.04¾	.04¾	.05
135-137 a.m.p., per lb.	.05½	.05½	.05¾
Petrolatum, in bbls., carload lots, per lb.:			
Dark green	.01⅞	.01⅞	.01⅞
Amber	.03⅜	.03⅜	.03⅜
Extra amber	.03¾	.03¾	.03¾
Cream	.06¼	.06¼	.06
Lily white	.09	.09	.08½

*Lighterage 6.5c a barrel extra.

NEW YORK (BAYONNE) EXPORT PRICES

	Nov. 29	Nov. 22	Nov. 15
Gasoline, U. S. Motor, 58-60 437, in cases	.2390	.2390	.2390
Kerosene, standard white, in cases	.1715	.1715	.1715
Kerosene, water white, in cases	.1815	.1815	.1815
600 steam refined cylinder stock, in bbls.	.17	.17	.17
635 steam refined	.19	.19	.19
650 steam refined	.20	.20	.20
600 Pennsylvania flash	.23	.23	.23
630 Pennsylvania flash	.35	.35	.35
600 Warren E	.25	.25	.25
600 Oil City E	.24	.24	.24
Light 135 Bright Stock	.40	.40	.40
Dark 135 Bright Stock	.38	.38	.38

LOS ANGELES EXPORT PRICES

	Nov. 29		Nov. 22		Nov. 15	
Kerosene, water white	.04½	.04¾	.04½	.04¾	.04½	.04¾
U. S. Motor Gasoline, 53-55 437 e.p.	.06	.06⅛	.05¾	.06	.05¾	.06

CALIFORNIA CRUDE PRICES
Standard Oil Co.-Union Oil Co. (Effective April 1, 1927)*

Gravity—	Fullerton, Seal Beach, Long Beach, Huntington Beach, Richfield, Rosecrans, Dominguez, Torrance-Inglewood 1	Whittier, La Habra, Montebello 2	Kern River, Newhall-McKittrick, Midway-Sunset, Buena Vista, Lost Hills, Belridge, Buena Vista Hills 3	Coyote 4	Santa Fe Springs 5	Coalinga 6	Wheeler Ridge 7	Santa Maria, Ventura, Orcutt, Salt Lake 8
14°	.85	.85	.75	.85	....	.75	.75	.85
15°	.85	.85	.75	.85	....	.75	.75	.85
16°	.85	.85	.75	.85	....	.75	.75	.85
17°	.85	.85	.75	.85	....	.75	.75	.85
18°	.85	.85	.75	.85	....	.76	.75	.85
19°	.85	.85	.75	.85	....	.75	.75	.85
20°	.85	.85	.77	.85	....	.76	.76	.85
21°	.86	.85	.79	.86	.85	.77	.77	.85
22°	.87	.85	.81	.87	.85	.78	.78	.85
23°	.88	.85	.83	.88	.85	.79	.79	.85
24°	.89	.85	.85	.89	.85	.80	.80	.85
25°	.90	.86	.87	.90	.86	.81	.81	.86
26°	.92	.87	.89	.91	.87	.83	.82	.87
27°	.94	.88	.91	.92	.88	.85	.83	.88
28°	.96	.89	.93	.93	.89	.87	....	.89
29°	.98	.90	.96	.94	.91	.89	....	.91
30°	1.00	.91	.99	.95	.93	.91	....	.93
31°	1.03	....	1.02	....	.95	.93	....	.95
32°	1.06	....	1.05	....	.97	.95	....	.97
33°	1.09	....	1.08	....	.99	.97	....	.99
34°	1.12	....	1.11	....	1.01	.99	....	1.01
35°	1.15	....	....	....	1.03	1.01	....	1.03
36°	1.18	....	....	....	1.06	....	....	1.06
37°	1.21	....	....	....	1.09	....	....	1.09
38°	1.24	....	....	....	1.12	....	....	1.12
39°	1.27	....	....	....	1.15	....	....	1.15
40°	1.30	....	....	....	....	....	....	....
41°	1.33	....	....	....	....	....	....	....
42°	1.36	....	....	....	....	....	....	....

*Column 1—Long Beach, Seal Beach and Huntington Beach crudes, 14 to 32 degrees, inclusive; Richfield and Fullerton, 14 to 30 degrees; Torrance and Inglewood, 14 to 28 degrees; Dominguez, 24 to 42 degrees. Rosecrans crude ranges from 14 to 42 degrees, but only Union Oil Co. posts below 24 degrees.

Column 2—Whittier crude, 14 to 22 degrees; Montebello, 14 to 30 degrees.

Column 3—Kern River, Newhall and McKittrick, 14 to 19 degrees; Midway-Sunset, Buena Vista and Elk Hills, 14 to 33 degrees; Lost Hills and Belridge, 14 to 34 degrees.

Column 8—Salt Lake, 14 to 19 degrees, inclusive; Santa Maria, 14 to 30 degrees; Ventura and Orcutt, 14 to 39 degrees. Posted only by Union Oil Co.

CRUDE OIL GRAVITY PRICE TABLE

Gravity—	Okla., Kans., N. & C. Tex., La.-Ark.	Smackover, Ark.	Stephens, Ark.	Gray County (Texas Panhandle) 4	Crane, Upton, Pecos, Crockett Counties (West Texas)	Salt Creek, Wyo.	Grade B & Light Crude (G. Coast) 7	Somerset (South Central Texas)
Below 24	....	.85	....	....	....	....	....	....
24 and above	....	1.00	....	....	....	....	....	....
Below 25	....	....	....	....	....	....	1.15	....
25 to 25.9	....	....	....	....	....	....	1.17	....
Below 26	....	....	....	....	.60	....	....	....
26 to 26.9	....	....	....	....	.60	....	1.19	....
27 to 27.9	....	....	....	....	.60	....	1.21	....
Below 28	(*)	....	1.00	....	....	....	....	....
28 to 28.9	1.12	....	1.02	.80	.60	....	1.23	....
29 to 29.9	1.14	....	1.04	.82	.60	1.14	1.25	....
30 to 30.9	1.16	....	1.06	.84	.60	1.16	1.27	....
31 to 31.9	1.18	....	1.08	.86	.60	1.18	1.29	....
32 to 32.9	1.20	....	1.10	.88	.60	1.20	1.31	1.05
33 to 33.9	1.22	....	....	.90	.60	1.22	1.33	1.07
34 to 34.9	1.24	....	....	.92	.60	1.24	1.35	1.09
35 to 35.9	1.26	....	....	.94	1.08	1.26	1.37	1.11
36 to 36.9	1.28	....	....	.96	.60	1.28	....	1.13
37 to 37.9	1.30	....	....	.98	....	1.30	....	1.15
38 to 38.9	1.32	....	....	1.00	....	....	....	1.17
39 to 39.9	1.34	....	....	1.02	....	....	....	....
40 to 40.9	1.36	....	....	1.04	....	....	....	....
41 to 41.9	1.38	....	....	1.06	....	....	....	....
42 to 42.9	1.40	....	....	1.08	....	....	....	....
43 to 43.9	1.42	....	....	1.10	....	....	....	....
44 to 44.9	1.44	....	....	1.12	....	....	....	....
45 to 45.9	1.46	....	....	....	....	....	....	....
46 to 46.9	1.48	....	....	....	....	....	....	....
47 to 47.9	1.50	....	....	....	....	....	....	....
48 to 48.9	1.52	....	....	....	....	....	....	....
49 to 49.9	1.54	....	....	....	....	....	....	....
50 to 50.9	1.56	....	....	....	....	....	....	....
51 to 51.9	1.58	....	....	....	....	....	....	....
52 and above	1.60	....	....	....	....	....	....	....

Column 1—Magnolia Petroleum Co. posted new schedule September 14, making price below 30 gravity $1.05 per barrel, with 2 cents increase per degree higher in gravity, taking 30-30.9 gravity at $1.16 as basis, with a top price of $1.60 for 52 and above.

Oklahoma: Prairie Oil & Gas Co., Sinclair Oil & Gas Co., Gypsy Oil Co., March 12; Carter Oil Co., The Texas Company, March 14.

North Central Texas—[Including Ranger, Mexia, Powell, Richland, Wortham, Lytton Springs (Southwest Texas), Iatan and Panola (Magnolia only), Currie, Nocona, Moran and Corsicana light]: Texas, Prairie, Sinclair and Gulf, March 12; The Texas Company, Humble Oil & Refining Co., March 14.

Kansas—Prairie, Sinclair, March 12; Carter, Texas, March 14.

Arkansas and North Louisiana—[Caddo, Bull Bayou, Crichton, De Soto, Haynesville, Homer and El Dorado only]; Standard Oil Co. of Louisiana, March 14; The Texas Company, March 14; Magnolia Petroleum Co., Pine Island, Haynesville and Bull Bayou, El Dorado, Gulf Pipe Line Co., March 14.

Column 2—November 19, Louisiana Oil Refining Co. On November 31, Standard Oil Co. of Louisiana, Magnolia Petroleum Co., Gulf Refining Co., and Atlantic Producing Co.

Column 3—Atlantic Oil Producing Co., March 14.

Column 4—Humble Oil & Refining Co. and Gulf Pipe Line Co., March 14. On August 23 Magnolia Petroleum Co. posted flat 75 cents.

Column 5—Humble Oil & Refining Co., August 23; Kay County Gas Co., Magnolia Petroleum Co., and Gulf Pipe Line Co., August 24.

Column 6—Midwest Refining Co., March 12. All crude over 37 gravity, $1.30 per barrel.

Column 7—Humble Oil & Refining Co. and other major buyers (schedule ends "35 and above"), March 14, with exception of Magnolia Petroleum Co., which stops at 31 degrees gravity. Sun Pipe Line Co. posts 2 cents differential for each degree above 35 gravity and $1.47 for 40 gravity and above.

Column 8—Grayburg Pipe Line Co. and Pioneer Oil & Refining Co., April 7.

*Prices for crude below 28 gravity; Oklahoma, Kansas and Texas, Magnolia Petroleum Co., $1.10, March 12; Arkansas, North Louisiana, March 14. Other companies, 2 cents less for each degree, with exception of Humble Oil & Refining Co., which pays 90 cents for crude below 25 degrees gravity, effective November 16.

CRUDE OIL PRICES

OKLAHOMA, KANSAS, NORTH AND EAST CENTRAL TEXAS

*Corsicana heavy (March 14, 1927).....$1.00
Other fields.....See gravity table

*Posted by Magnolia Petroleum Co.

TEXAS PANHANDLE

*Carson County.....$ .75
*Hutchinson County.....75
*Wheeler County.....75
Gray County.....See gravity table

*Humble Oil & Refining Co.
Magnolia Petroleum Co., Gulf Pipe Line Co., and Kay County Gas Co., August 23.

*Iatan.....Same as North Texas
Crane-Upton-Crockett.....See gravity table
**Glasscock.....$ .80

*Includes Howard County and Westbrook Fields. Kay County Gas Co. pays $1.05 for Howard County crude, effective May 21.
**Magnolia Petroleum Co., Oct. 24.

ARKANSAS-NORTH LOUISIANA

Cotton Valley (March 17).....$1.00
Bellevue (Feb. 24, 1927).....1.25
Urania (Nov. 18, 1927).....75
East El Dorado (Sept. 20).....90
Other fields.....See gravity table

Note—Cotton Valley and Bellevue, Standard Oil Co. of Louisiana, Gulf Refining Co. and Magnolia Petroleum Co.; Urania, Louisiana Oil Refining Corp.; East El Dorado, Magnolia Petroleum Co., Gulf Refining Co.

GULF COAST

(Goose Creek, Hull, Liberty, West Columbia, Orange, Boling, Sour Lake, Humble, High Island, Pierce Junction and Spindletop.)

‡Grade A (March 14).....
Grade B.....See gravity table
*Jennings, La. (March 14).....$1.05
†Saratoga, Batson, Dayton (March 14, 1927).....$1.30
§Markham (March 14).....1.00

*Gulf Pipe Line Co. †Sun Pipe Line Co. ‡Humble Oil & Refining Co. and other major buyers. §The Texas Company.

SOUTH CENTRAL AND SOUTHWESTERN TEXAS

*Luling (May 5).....$1.00
†Mirando (March 14).....1.00
Rockdale-Minerva (April 15):
38-38.9 gravity.....1.27
39-39.9 gravity.....1.29
40 and above.....1.31
*Thrall.....
Callihan (May 15).....1.75
Lytton Springs (Lockhart) See gravity table
Somerset.....See gravity table

*Posted by Magnolia Petroleum Co. Thrall prices same as North Central Texas less 19½ cents per cwt. freight.
†Magnolia Petroleum Co., Humble Oil & Refining Co., Crown Central Pipe Line Co.

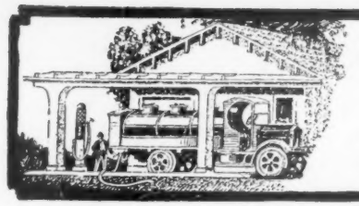
ROCKY MOUNTAIN STATES

Ohio Oil Co.-Midwest Refining Co.

(Effective March 14)

Rock Creek, Wyo. (March 12).....$1.25
Salt Creek.....See gravity table
Big Muddy (March 12).....$1.25
Mule Creek (May 1).....1.10
Grass Creek, heavy.....90
Grass Creek, light.....1.33
Elk Basin (March 12).....1.33
Lance Creek (March 12).....1.33
Poison Spider.....1.00
Notches.....65
Rex Lake (February 22).....1.10
Osage.....1.33
Lost Soldier (contract).....95
Greybull-Torchlight.....1.33
Hamilton Dome.....85
Cat Creek (Mont.).....1.33
Sunburst (Mont.).....1.35

(Continued on Page 278)



TANK WAGON MARKETS

Tank wagon quotations for gasoline and kerosene in United States as furnished by the larger marketing concerns Nov. 29.

ALL TANK WAGON AND SERVICE STATION QUOTATIONS INCLUDE TAXES

STANDARD OIL CO. (INDIANA)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Chicago dist.	16.0	18.0	2.0	12.0
Decatur, Ill.	10.5	12.5	2.0	12.1
E. St. Louis	15.1	17.35	2.0	11.2
Joliet	16.4	18.4	2.0	12.3
Peoria	12.2	12.2	2.0	12.1
Quincy	16.2	18.2	2.0	11.9
Davenport, Ia.	15.5	17.5	3.0	12.3
Des Moines	13.9	15.9	3.0	12.3
Keokuk	17.5	19.5	3.0	12.3
Sioux City	17.1	19.1	3.0	11.9
Duluth, Minn.	15.5	17.5	2.0	12.9
Minneapolis	14.0	14.0	2.0	12.9
Mankato	14.1	16.1	2.0	12.7
LaCross, Wis.	17.2	19.2	2.0	13.0
Milwaukee	16.1	18.1	2.0	11.9
Madison	16.3	18.3	2.0	12.1
Detroit, Mich.	15.8	17.8	3.0	13.7
Grand Rapids	14.0	16.0	3.0	13.6
Saginaw	17.9	19.9	3.0	13.8
Evansville, Ind.	17.0	19.0	3.0	13.0
Ft. Wayne	14.0	14.0	3.0	13.4
Indianapolis	14.2	15.2	3.0	12.2
South Bend	15.0	15.0	3.0	13.4
Fargo, N. D.	15.0	17.0	2.0	14.9
Huron, S. D.	19.5	21.5	4.0	13.9
Sioux Falls	15.0	17.0	4.0	13.4
*K. C., Mo.	14.9	16.9	3.0	10.6
*Springfield	16.8	18.8	3.0	11.5
*St. Louis	15.6	17.9	2.5	11.3
*St. Joseph	14.5	16.5	3.0	11.2
Wichita, Kans.	14.8	16.8	2.0	10.8
Bartlesville, Ok.	15.8	17.8	3.0	10.8

NAPHTHAS

	Tank wagon	Tank car
Oleum spirits	16.0	10.75
V. M. & P. naphtha	18.0	12.75
Cleaner's naphtha	18.0	13.75
Stanisol	19.0	....

Tank wagon prices f.o.b. Chicago; tank car prices f.o.b. Whiting.

STANOLIND FURNACE OIL

Less than 100 gallons	9.0
100 to 799 gallons	8.0
800 or more gallons	7.5

Tank wagon prices of gasoline subject to discount of 1 cent a gallon on dumps of 50 gallons or more throughout territory except Chicago district where discount applies only to dumps of 100 gallons. Kerosene subject to 1 cent discount on dumps of 50 gallons or more.

Outside the Chicago district, the following quantity discount schedule is in effect on monthly tank wagon deliveries of gasoline; 6,000 gallons or more, 1½ cents; 10,000 gallons or more, 2 cents; 15,000 gallons or more, 3 cents. These discounts include the 1 cent allowed on dumps of 50 gallons or more at one delivery.

Within the Chicago district, the following quantity discount schedule is in effect on tank wagon deliveries of gasoline; 750 to 2,000 gallons, one-half cent; 2,000 to 3,000 gallons, three-fourths cent; 3,000 to 6,000 gallons, 1 cent; 6,000 to 10,000 gallons, 1½ cents; 10,000 to 15,000 gallons, 2 cents; 15,000 gallons or more, 3 cents. These discounts are in addition to the special discount of 1 cent on dumps of 100 gallons or more at one delivery.

If the quantity bought during the year is equal to or exceeds 12 times the agreed monthly quantity, the discount is paid or credited on the entire quantity at the close of the term less the monthly payments made during the year.

*State tax 2 cents; remainder city tax.

OHIO

Standard Oil Co. (Ohio)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
All Ohio points	17.0	19.0	3.0	14.5

SOUTHWESTERN DISTRICT

Magnolia Petroleum Co.*

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Dallas, Tex.	14.0	17.0	3.0	11.0
Fort Worth	14.0	16.0	3.0	10.0
Houston	13.0	15.0	3.0	15.0
San Antonio	13.0	15.0	3.0	10.0
El Paso	14.0	15.0	3.0	16.0
Texarkana	15.0	18.0	3.0	12.0
Muskogee, Ok.	15.0	18.0	3.0	9.0
Okla. City	13.0	14.0	3.0	9.0
Tulsa	13.0	14.0	3.0	9.0
Ft. Smith, Ark.	14.0	17.0	3.0	12.0
Little Rock	16.0	16.0	5.0	12.0

*The following is the schedule of discounts on quantity gasoline sales adopted by the Magnolia Petroleum Co. in Oklahoma: Over 750 gallons a month, one-half cent; over 2,000 gallons, three-quarters cent; over 3,000 gallons, 1 cent; over 4,500 gallons, 1¼ cents; over 6,000 gallons, 1½ cents; over 8,000 gallons, 1¾ cents; over 10,000 gallons, 2 cents. If the quantity bought during the year is 12 times the monthly agreed purchases, the discount will be paid or credited on the entire quantity for the year less any monthly purchases.

The schedule on service station deliveries is: Over 200 gallons a month, 1 cent; over 300 gallons a month, 1¼ cents; over 400 gallons, 1½ cents; over 500 gallons a month, 1¾ cents; over 600 gallons, 2 cents. The same rule applies for annual purchases in the tank wagon discounts.

CENTRAL SOUTH DISTRICT

Standard Oil Co. (Louisiana)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
*N. Orleans, La.	15.5	17.5	3.0	14.0
Baton Rouge	14.0	17.0	2.0	12.5
Alexandria	15.0	18.0	2.0	14.0
LaFayette	15.0	18.0	2.0	13.5
Lake Charles	15.5	18.5	2.0	14.0
Shreveport	15.5	18.5	2.0	13.0
Ko'xville, T'nn.	19.5	22.5	3.0	16.0
Memphis	15.0	16.5	3.0	14.0
Chattanooga	19.5	22.5	3.0	15.0
Nashville	18.0	21.0	3.0	15.0
Bristol	19.0	22.0	3.0	14.0
Lit. Rock, Ark.	16.0	16.0	5.0	12.0

*Tax of 3 cents includes city tax of 1 cent.
*Louisiana kerosene prices include 1-cent state tax and 1-cent parish tax.

SOUTHERN DISTRICT

Standard Oil Co. (Kentucky)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Atlanta, Ga.	14.0	16.0	4.0	15.5
Augusta	19.0	22.0	4.0	16.5
Macon	19.0	22.0	4.0	16.5
Savannah	17.0	19.0	4.0	14.5
Birm'h'm, Ala.	18.0	21.0	4.0	15.5
Mobile	17.0	20.0	4.0	15.0
Montgomery	19.0	22.0	5.0	16.5
Clarks'le, Miss.	17.0	20.0	4.0	12.5
Jackson	17.0	20.0	4.0	13.5
Natchez	16.5	19.5	4.0	14.0
Gulfport	18.5	21.5	6.0	14.0
Vicksburg	16.5	19.5	4.0	14.0
Jack'ville, Fla.	18.0	21.0	5.0	14.0
Miami	20.0	23.0	5.0	15.5
Pensacola	19.0	22.0	5.0	14.0
Tampa	18.0	21.0	5.0	14.0
Lexington, Ky.	18.0	21.0	5.0	15.5
Covington, Ky.	19.0	22.0	5.0	15.5
Louisville	18.0	21.0	5.0	15.0

In addition to the state tax of 2 cents on gasoline, Montgomery has city tax of 1 cent on gasoline. Kerosene prices in Georgia includes 1 cent tax. In Florida, an inspection fee of 0.125 cent; in Alabama, an inspection fee of one-half cent on kerosene only. Pensacola tax includes 1 cent city levy. Gulfport tax includes privilege tax of 2 cents in addition to state tax.

PENNSYLVANIA-DELAWARE AND PART NEW ENGLAND

Atlantic Refining Co.

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Pittsburgh, Pa.	16.0	*22.0	...	14.0
Philadelphia	14.0	17.0	...	14.0
Scranton	16.0	*22.0	...	14.0
Allentown	16.0	*22.0	...	14.0
Altoona	16.0	*22.0	...	14.0
Erie	14.0	*18.0	...	14.0
Dover, Del.	19.0	22.0	3.0	14.0
Wilmington	19.0	22.0	3.0	14.0
Spring'd, Mass.	17.0	17.0	...	15.0
Worchester	17.0	17.0	...	15.0
Boston	17.0	17.0	...	15.0
Providence, R.I.	19.0	19.0	2.0	15.0
Hartford, Conn.	21.0	22.0	2.0	15.0
New Haven	21.0	22.0	2.0	15.0

*Includes tax of 3.0 cents. Pennsylvania tax is collected by the dealer and paid by him direct to the state.

NEW YORK AND PART OF NEW ENGLAND DISTRICT

Standard Oil Co. (New York)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Albany, N. Y.	17.0	19.0	...	15.0
*New York	17.0	19.0	...	15.0
Buffalo	17.0	19.0	...	14.0
Rochester	13.0	16.0	...	14.0
Syracuse	17.0	19.0	...	15.0
Boston, Mass.	17.0	19.0	...	15.0
Augusta, Me.	20.0	22.0	3.0	15.0
M'nch't'r, N.H.	18.0	22.0	3.0	15.0
Burlington, Vt.	20.0	22.0	3.0	15.0

*Price in steel barrels.

PACIFIC COAST DISTRICT

Standard Oil Co. (California)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
San Francisco	17.0	21.0	3.0	15.5
Pueblo	18.0	18.0	3.0	15.5
Los Angeles	16.5	20.5	3.0	15.5
Reno, Nev.	22.0	26.0	4.0	19.0
Portland, Ore.	17.5	21.5	3.0	16.5
Seattle, Wash.	16.5	20.5	2.0	16.5
Tacoma	16.5	20.5	2.0	16.5
Spokane	20.5	24.5	2.0	20.5
Phoenix, Ariz.	22.0	26.0	3.0	20.5

ATLANTIC COAST DISTRICT

Standard Oil Co. (New Jersey)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Atlantic City	18.0	20.0	2.0	14.0
Newark, N. J.	18.0	20.0	2.0	14.0
Annapolis, Md.	20.0	22.0	4.0	12.0
Baltimore	20.0	23.0	4.0	10.0
Cumberland	20.0	23.0	4.0	14.0
Washington	18.0	21.0	2.0	12.0
Danville, Va.	20.5	....	4.5	14.0
Norfolk	20.5	23.5	4.5	12.0
Petersburg	20.5	23.5	4.5	14.0
Roanoke	20.5	23.5	4.5	14.0
Richmond	18.5	21.5	4.5	14.0
Ch'rlst'n, W.Va.	20.0	23.0	4.0	14.0
Keyser	20.0	....	4.0	14.0
Parkersburg	17.0	20.0	4.0	14.0
Wheeling	20.0	23.0	4.0	14.0
Charlotte, N. C.	20.0	23.0	4.0	14.0
Hickory	20.0	23.0	4.0	14.0
Mt. Airy	20.0	23.0	4.0	14.0
Salisbury	20.0	23.0	4.0	14.0
Charl'stn, S. C.	20.0	23.0	5.0	14.0
Columbia	20.0	20.0	5.0	14.0

NEBRASKA

Standard Oil Co. (Nebraska)

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Omaha	14.25	16.26	2.0	12.25
McCook	14.75	14.75	2.0	11.00
Norfolk	16.75	18.75	2.0	12.75
N. Platte	17.75	19.75	2.0	13.50
Scottsbluff	17.25	19.25	2.0	13.00

ROCKY MOUNTAIN DISTRICT

Continental Oil Co.

	Gasoline Tank wagon	Gasoline Service station	Gasoline Incl'd's tax of	Kero. tank wagon
Denver, Colo.	16.0	16.0	3.0	12.5
Pueblo	15.0	15.0	3.0	14.5
Grand Jnctn.	20.0	22.5	3.0	18.0
Casper, Wyo.	17.0	19.0	3.0	13.0
Cheyenne	18.0	20.0	3.0	14.5
Butte, Mont.	22.0	22.0	3.0	19.0
Helena	22.5	24.5	3.0	19.0
Salt Lake, Utah	21.0	23.0	3.5	17.0
Boise, Idaho	23.5	25.5	4.0	19.0
Twin Falls	23.5	25.5	4.0	19.0
Albu'que, N. M.	21.0	24.0	5.0	17.0

TANK WAGON CHANGES

November 19 — Standard Oil Co. of Kentucky reduced the gasoline tank wagon and station prices 1 cent at Louisville, Ky., making the new prices 18 cents and 21 cents respectively.

November 22—Standard Oil Co. of Indiana reduced the gasoline tank wagon and station prices 3 cents at Mankato, Minn., making the new prices 14 cents and 16 cents respectively.

November 23 — Standard Oil Co. of Louisiana reduced the gasoline tank wagon price 1½ cents at Memphis, making the new price 15 cents.

GULF COAST MARKETS REFLECT COMPETITION

HOUSTON, Tex., Nov. 28.—The Gulf Coast lubricating oil market the past week continued to reflect the competition of outside material being offered freely at low prices. The general unsettled and weak situation prevailed with apparently no immediate relief in sight.

Low prices being quoted for Atlantic Seaboard material being shipped in were met openly by larger companies marketing strictly Gulf Coast lubricants but these prices admittedly were forcing Gulf Coast sellers to operate on an extremely close margin of profit.

The outside competition so far has been confined to the higher viscosity filtered oils but the narrowing of price ranges between these and unfiltered pale and red oils naturally has resulted in general revision of the latter stocks. However, with nothing under the 500 viscosity filtered oils being offered by the outside competition there is a slight tendency for sellers of strictly Gulf Coast products to steady prices of some grades of red and pale unfiltered oils. Some Gulf Coast lubricant stocks are moving northward for the winter season of zero cold test products but even this movement is being curtailed to a large extent by shipments of lubs from the same sources which have been placing material on Gulf Coast and southern markets.

To what extent those products have been quoted in competition with Mid-Continent sellers is not known here but it is understood the eastern manufacturers expect to move considerable material into the Mid-Continent's marketing territory. Other Gulf Coast products continued unchanged, and, although the fuel oil and gas oil markets were weak, no great amount of material, particularly gas oil, was offered on the spot market, extremely warm weather which has prevailed in this district has curtailed any local industrial demand for fuel oil. Bunker sales were fair.

WEST TEXAS

FORT WORTH, Tex., Nov. 29.—Humble Oil & Refining Co.'s No. 1 Hendrick-B in NW cor. SE, Section 29, Block B-5, Winkler County, flowed 250 bbls. an hour at 2,968 feet. McMan & Marland's No. 1 Yates in Section 34½, Block 194, Pecos County, flowed 1,274 bbls. Monday through a three-eighths-inch choke. This well flowed at rate of 1,120 bbls. an hour Saturday in a 15-minute test before pinching after it had been deepened from 1,313 to 1,327 feet.

FEDERAL TRADE REPORT

The annual report of the Federal Trade Commission says that it was impossible to complete the inquiry into gasoline prices before the close of the last session of Congress. The report is now being considered by the commission preparatory to presentation to Congress. The commission also reports on the inquiry into the Panhandle price reduction in October last year, showing that "because of its peculiar character the oil was more difficult to handle and more expensive to refine."

CRUDE OIL PRICES

(Continued from Page 277)

Artesia (March 12)	1.00
Hogback (N. Mex.) (March 14)	1.38

Note: Salt Creek, Osage, Cat Creek, Greybull and Hogback posted by Midwest Refining Co., and the remainder by the Ohio Oil Co. Both companies post Grass Creek light and Elk Basin.

EASTERN STATES

Joseph Seep Purchasing Agency
(Effective August 1)

Penna Grade Oil in New York Transit Line (New York)	$2.65
Bradford District Oil in National Transit Lines (Pennsylvania)	2.65
Penna Grade Oil in National Transit Lines (Pennsylvania)	2.55
Penna Crude Oil in Southwest Pennsylvania Lines (West Virginia)	2.55
Penna Grade Oil in Eureka Pipe Line lines (Pennsylvania)	2.50
Penna Grade Oil in Buckeye Pipe Line lines (Ohio) (August 22)	2.25
Cabell Grade Oil in Eureka Pipe Line lines (West Virginia) (March 16)	1.40
Corning 35-cent grade oil in Buckeye Pipe Line Co.'s line (March 17)	1.35
Corning 25-cent grade oil in Buckeye Pipe Line Co.'s lines (March 17)	1.45
Somerset Oil in Cumberland Pipe Line lines (Kentucky) (March 16)	1.50
Ragland Grade Oil in Cumberland Pipe Line lines (Kentucky)	.95
Keister (Pennsylvania)	1.10

MIDDLE WESTERN STATES

Ohio Oil Co.
(Effective March 14)

Lima	$1.71
Wooster	1.57
**Saginaw, Mich., Saginaw Sand (May 27)	2.05
Illinois	1.60
Indiana	1.48
Princeton	1.60
Plymouth	1.33
Waterloo (Nov. 17, 1926)	1.35
*Western Kentucky	1.33
**Saginaw, Mich., Berea Sand (May 27)	1.95
†Cumberland, Barren, Clinton and Monroe Counties, Kentucky (March 16)	1.50
‡Oil in lines of Stoll Oil Refining Co. in Oil City, Ky. (March 16, 1927)	1.50
†Clay County, Tennessee (Nov. 18)	2.35
§Oil Springs (Canada)	2.18
§Petrolia (Canada)	2.11

*Posted by Ohio Oil Co.
†Posted by Paragon Development Co.
‡Posted by Stoll Oil Refining Co.
§Posted by Imperial Oil Co., Ltd.
**Posted by Sun Oil Co.

MEXICAN CRUDE

Note—Due to the fact that the exportation of Tuxpam light crude oil his become a negligible factor, prices will no longer be published.

*Panuco heavy (f.o.b. Mex. ports)	$1.15

*17.496 cents tax.

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WHEN a Dealer displays this sign, his business grows! Why?—because back of this sign is a successful method for giving motorists *correct lubrication!*

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Oil Securities Quiet During the Week

Pipe Line Issues Getting Some Attention. Nothing Develops Warranting Extensive Movement in Oils

The pipe line stocks have come in for a good bit of attention lately, with many of the offerings on the Cumberland line experiencing substantial accumulation.

During the past week, Barnsdall was under pressure, and declined from 27 to 24⅞, but early this week regained fractionally. Transcontinental also slipped from above the 10 mark where it landed after the completion of several good wells in the Yates Pool of Pecos County.

There was nothing in the general financial or economic situation to justify any extensive movement in the oils.

Standard Oil Dividends

Carl H. Pforzheimer & Co. state that preliminary estimates indicate that the Standard Oil group of companies will disburse $213,617,940 in cash dividends in 1927 which will be $13,290,346 greater than last year, and which will also establish a new high record for annual cash disbursements. Of the increased amount paid out, special dividends by Indiana Pipe, Southern Pipe and Crescent Pipe accounted for $3,416,000, and the remainder represented increased payments to stockholders. Of the $213,617,940 paid out during the year, it is estimated that four leading companies will account for $130,357,418. Standard Oil Co. of New Jersey heads the group with payments totaling $38,423,860. While the company retired its preferred stock issue on March 15, 1927, which reduced its dividend requirements $3,499,526 quarterly, the outstanding amount of common stock was increased which together with extra dividends resulted in the total payments for 1927 exceeding last year's dividend by $1,195,081.

In view of the generally unsatisfactory condition prevailing in the oil industry during the greater part of this year, Carl H. Pforzheimer & Co. say, the increase in the amount of cash dividends to stockholders clearly demonstrates the soundness of the conservative financial policies of the Standard Oil management and their ability to maintain dividends through periods of severe depression in the industry.

Most of the important declarations for the last quarter have been made and it is estimated that $55,724,472 will be disbursed in the final quarter. This is $7,996,032 greater than in the third quarter but $6,961,076 less than the final quarter in 1926.

Humble Pipe Line

W. S. Farish, president of the Humble Oil & Refining Co., states that the increase in capital of the Humble Pipe Line Co., a subsidiary, from $24,000,000 to $50,000,000, and made for the purpose of making the amount of capital stock of a size more representative of the investment in the company's pipe line facilities in Texas. He added that the Humble Pipe Line Co.'s investment in Texas exceeded by several millions the new $50,000,000 capital applied for the state authorities, and that the increase of $26,000,000 did not equal the amount of new capital put into construction of pipe lines in Texas this year.

Shell Union Oil

The Shell Union Oil Corp. and subsidiaries for the quarter ended September 30, 1927, report profit of $3,814,274 after depreciation, depletion, etc., but before federal taxes. This compares with $2,306,162 in the preceding quarter and $13,953,060 in the third quarter of 1926.

The profit for the first nine months of 1927, amounted to $11,403,691 before Federal taxes, against $31,193,437 in the same period of the previous year. Stock outstanding amounts to 10,000,000 shares of no par common stock. The 6 per cent preferred stock has all been retired.

The consolidated income account for the quarter ended September 30, 1927, compares with 1926 as follows:

	1927	1926
Total income	$12,472,083	$20,788,285
Depreciation, depletion, etc.	8,657,809	6,835,225
*Profit	$ 3,814,274	$13,953,060
Preferred dividends	.....	255,981
Com. dividends	3,500,000	3,500,000
Sulprus	$ 314,274	$10,197,079
P. & L. surplus	35,806,829	44,727,374

Nine months ended September:

Total income	$35,941,570	$51,403,254
Depreciation, depletion, etc.	24,537,879	20,209,817
Profit	$11,403,691	$31,193,437
Preferred dividends	385,434	770,842
Com. dividends	10,500,000	10,500,000
Surplus	$ 518,257	$19,922,595

*Before federal taxes.

Superior Oil

The Superior Oil Corp. reports for the quarter ended September 30, 1927, net loss of $249,624 after interest, depreciation, depletion, etc., comparing with net loss of $82,745 in the preceding quarter and net profit of $64,939, or 5 cents a share, earned on 1,102,238 no par shares of stock, in the third quarter of 1926.

Net loss for the first nine months of 1927 totaled $7,987 after the above charges, against net loss of $310,821 in the first nine months of the previous year.

The consolidated income account for the quarter ended September 30, 1927, compares as follows:

	1927	1926
Gross	$ 337,761	$ 523,185
Exp., int., ect.	230,675	200,299
Depreciation	169,257	107,585
Depletion	187,453	150,362
Net loss	$ 249,624	†$64,939

Nine months ended September 30:

	1927	1926
Gross	$2,052,771	$1,070,336
Exp., int., etc.	743,825	703,614
Depreciation	786,423	311,554
Depletion	530,510	359,989
Net loss	$ 7,987	$ 310,821

*Includes depreciation and depletion.
†Profit.

Western Exploration Co.

At a meeting of the directors of the Western Exploration Co. at Casper, Wyo., a dividend of one-half per cent, or 2½ cents per share, was declared payable December 20 to stockholders of record of December 15, 1927.

Russian Purchase

The announcement that the Standard Oil Co. of New York and Vacuum Oil Co. had extended their purchases of Russian oil had no effect on the European situation. However, in some quarters it is looked upon as favorable, inasmuch as it should take just that much more Russian oil from the European market.

The new Standard Oil Co. of New York contract calls for an additional 60,000 tons a year of kerosene, gas oil and fuel oil. The Vacuum Oil Co. will take altogether 225,000 tons annually, including the new purchase, while the total purchases of the New York company will amount to 1,400,000 tons a year. All this oil is for the Far East and Near East markets.

While this situation has not affected the European markets, it is expected the markets which will absorb this oil will be unfavorably affected. A price war has been in progress both in the Far East and Near East for some time, and prices are understood to have been cut about 40 per cent so far this year.

Reports that the Dutch-Shell combine will undertake reprisals against the Standard of New York and Vacuum in other markets are not credited here. If the Dutch-Shell combine does expand in such markets as the United States, it will not be because of the Russian oil controversy.

The Dutch-Shell campaign is not directed against the Standard Oil Co. of New Jersey, which markets oil throughout Europe, and it is not likely the Shell group would care to undertake a price war against the Standard's biggest unit.

NEW YORK STOCK EXCHANGE—LIST OF ACTIVE STOCKS

Stocks—	Par	Clos. Nov.28	Quot. Nov.21	1927 High	1927 Low	1926 High	1926 Low	1925 High	1925 Low
Amerada Corp.	..	29⅜	29⅜	37½	27⅝	32⅞	24¾	..	..
Atlantic Refining, com.	100	114½	$114⅜	131⅜	107	128⅜	97	117½	95½
Barnsdall "A"	25	25	26⅜	35½	20¾	32½	23½	33½	18¾
California Petroleum, com.	25	22⅝	23	32⅞	20	38⅛	30⅞	34⅜	23⅜
Houston Oil	100	158	158¼	175¾	60½	75	50¼	85	50
Independent Oil & Gas	..	24⅜	25¼	32¾	17⅝	34	20¼	41⅜	13½
Louisiana Oil	10	10¼	10⅝	18⅛	10½	19⅝	12	23¾	13⅜
Maracaibo	..	12	12½	22¾	12	27⅜	18⅜	35½	20¾
Marland	..	35¼	35⅞	58⅛	31	63⅜	41¼	60⅛	31⅝
Mid-Continent Petroleum	..	28⅜	28½	39⅜	25½	41	25⅜	38	25⅜
National Supply	50	94	91	95¾	76	84⅞	55½	71	54¾
Oil Well Supply	25	35	33¼	44⅜	31¼	36	30	38	33⅜
Pan American, B	50	50	51¼	66⅜	45⅛	72⅜	56⅛	83⅞	59½
Pan American, Western B	..	20	20	37⅞	16⅜	46	34	94⅜	37¼
Phillips Petroleum	..	41⅞	42½	60¼	36½	54⅞	42⅛	47⅛	37¼
Producers & Refiners	50	25⅜	26¼	33⅞	16⅜	26	11	32⅜	12½
Pure Oil, com.	..	25⅜	26	33½	25	31	25⅜	33⅜	32½
Royal Dutch, N. Y., sh.	13.40	47⅛	48½	54½	44¼	57⅜	49⅜	57⅜	48¼
Shell Transport	10	42⅝	43¼	49	41½	48⅞	42	49	30⅜
Shell Union, com.	..	26⅜	27	31⅜	24⅝	30⅝	24	28¾	21⅝
Simms Petroleum	10	19	19⅝	22⅜	14¼	25⅝	16½	28½	18⅜
Sinclair Consolidated	..	17	16⅜	22⅜	15¼	24⅞	16⅜	24⅞	17
Skelly Oil	25	27	27½	37⅜	24½	37⅛	27	32½	21¾
Standard of California	25	55⅜	56⅛	60⅜	50⅜	63½	54	67¼	52½
Standard of New Jersey, com.	25	40	40½	41⅜	35⅛	46⅝	37½	47½	38⅜
Standard of New York	25	31⅜	32⅛	34⅛	29⅜	47¼	30⅝	48⅜	40
Sun Oil Co.	..	31⅛	33	34⅞	30	41¼	30⅛	43⅞	38½
The Texas Company	25	53¼	53¼	58	45	58	48	55	43⅜
Texas Pacific Coal & Oil	10	13⅜	13⅜	18⅞	12	19½	12⅛	23¼	11
Tide Water Associated Oil	..	16⅞	17	19⅛	15⅜	21	17	..	..
Transcontinental	..	9⅛	9⅜	10⅜	3¾	5½	3	5⅝	3½
Union Oil of California	25	43⅞	44⅜	56½	39⅜	53⅜	37¼	43⅝	38½
Union Tank, com.	100	111	118	120⅞	94	120⅜	84¼	‡134	118
White Eagle Oil & Refining	..	22¾	23	27½	21¾	29⅜	25⅛	28⅜	25⅝
Standard Oils									
Anglo-American Oil	£1	19¼	19⅜	21⅝	17⅛	19¾	16½	26¾	17½
Borne Scrymser	25	57	57	69	49½	75	65	‡240	205
Buckeye Pipe Line	50	58½	59	59	45	59½	42	72	63½
Chesebrough Manufacturing Co.	25	123	119	126	76½	81⅛	63	74	48¾
Continental	10	18⅝	18⅜	22⅝	16⅛	25⅞	10¼	31⅛	21⅞
Cumberland Pipe Line	100	93	94	‡137	90	137	102	156	128
Eureka Pipe Line	100	65	65	65	47	43¾	43	96	61¼
Galena Signal, com.	100	7	7¼	13½	7½	32½	9⅞	68½	23½
Humble Oil & Refining Co.	25	66	66⅜	66⅜	54	99⅜	52	99	40½
Illinois Pipe Line	100	181½	176	181½	123⅜	144	131	154½	124
Imperial Oil	..	59¼	60¼	64⅜	37⅝	39⅜	32½	39¼	27¼
Indiana Pipe Line	50	93	89	93	61	68	52¼	84	57⅛
International Petroleum Co.	10	33⅛	32⅜	34⅞	28¼	35¼	28⅜	25⅜	20⅛
National Transit Co.	12.50	23¼	22⅞	23¼	13¼	30⅜	27⅛	25½	16½
New York Transit	100	41	42	42	31¼	61½	27¼	70	50
Northern Pipe Line	100	96	95	96	70	80½	64	88	67½
Ohio Oil Co.	25	65⅝	60⅝	60⅝	52	67¾	55⅜	75¼	60
Penn-Mex Fuel	25	33	32	36⅛	12	24¼	15	44	19
Prairie Oil & Gas	25	49	50⅜	55½	45⅝	60¼	49	65½	45⅞
Prairie Pipe Line	100	183	186¾	189¼	132	137½	122½	129¾	105
Solar Refining Co.	100	180	190	‡201½	178	212	184½	259	200
South Penn Oil	25	38¾	39	41½	34½	50	30	‡197	139
Southwest Pa. Line	100	70	77	77	55½	56	47½	84	50
Southern Pipe Line	50	22	39	39	18½	27	34	‡103	63
Standard of Indiana	25	78¼	80¼	80¼	64⅝	70½	60½	70⅜	69¼
Standard of Kansas	25	16¼	16⅛	20⅞	15⅝	36½	16½	45	30
Standard of Kentucky	25	125½	125	125½	111½	134⅜	108	137	114⅜
Standard of Nebraska	25	43	44	49½	43	51⅛	42	‡270	231
Standard of Ohio, com.	100	81	78½	81½	72	362	192½	369	338
Swan & Finch, com.	25	19½	19	21	14½	21	18	27	12
Vacuum Oil	25	143¾	147	147	95⅛	109⅜	94⅛	109½	80½
Miscellaneous									
Gulf Oil Corp. of Pa.	25	105	104⅞	105	86¼	95	82½	98¼	63½

*Bid, no sales. †Old stock. ‡New stock. §Ex-dividend.

Quotations furnished by W. J. Wollman & Co.

The Oil and Gas Journal's weekly average price of 20 representative petroleum stocks listed on the New York Stock Exchange was as follows:

Nov. 28	62.92	Oct. 24	60.45	Sept. 19	60.83
Nov. 21	63.66	Oct. 17	59.22	Sept. 12	61.20
Nov. 14	62.78	Oct. 10	59.20	Sept. 5	60.60
Nov. 7	61.30	Oct. 3	60.97	Aug. 29	60.41
Oct. 31	69.98	Sept. 26	61.30	Aug. 22	61.58

REDUCED STOCKS AID WEST COAST MARKET

LOS ANGELES, Calif., Nov. 25.—Figures just released by the American Petroleum Institute covering operations in the Pacific Coast territory for October, show that during this month total stocks decreased by 932,927 bbls. At the end of October there was still on hand more than 140,000,000 bbls. of petroleum products. Total stock decrease for 1927, however, up to October 31 was over 5,500,000 bbls. The decrease in stocks during October is due almost entirely to the drain on refinable crude of 20 degrees gravity A.P.I. and upward. Naphtha distillates was the only other product to show a decline during the month, both heavy crude including fuel oil, and gasoline, showing an increase. The largest increase was registered by gasoline which went up 355,467 bbls. during the month.

Taken as a whole, the statistical position of the industry is satisfactory on the Pacific Coast. In the face of almost continual increase in production, stocks have steadily decreased for the year. While gasoline only is about 2,000,000 bbls. ahead of last year at this time, the market continues to hold steady with a good chance that prices will remain at present levels. Figures just released by the Associated Oil Co. for October show that the daily average production of natural gasoline decreased 7,718 gallons in California. This would be very encouraging for the natural gasoline producer if it were not for the fact that due to the new deep sand at Signal Hill production during November is expected to be on the upward trend once more. Demand for natural gasoline, however, is good and prices are steady.

Fuel oil is holding up well, especially in the export trade. Some of the smaller refiners are hard pressed to move their stocks and must offer it at somewhat lower prices in order to get relief but on the whole prices for this commodity are also steady.

WILDCAT OPERATIONS IN PANHANDLE

(Continued from Page 54)

H. C. McCauley et al's No. 1 J. Morse, Sec. 2, Blk. 46, H. & G. N. Sur. — Drlg., 1,650 ft.
Magnolia Pet. Co.'s No. 1 J. Bowers — Drlg., 620 ft.
Magnolia Pet. Co.'s No. 1 J. J. Wall, NE cor., Sec. 162, Blk. 3, I. & G. N. Sur. — Bldg. rig.
Midwest Explt'n. Co.'s No. 1 J. Bowers — Drlg., 1,400 ft.
Neudigate et al's No. 1 A. Chapman, NE cor. E ½ SE, Sec. 52, Blk. 25 — 500,000 ft. gas, 2,760-65 ft; rainbow of oil, 2,820-25 ft; salt water; granite wash, 2,2827-28 ft; S.D., 2,835 ft.
Operators Oil Co.'s No. 1 Jackson — 1,000,000 ft. gas at 2,465 ft; T.D 2,760 ft; run 8-in.
Phillips Pet. Co.'s No. 1 Davidson (Myson) — Building rig.
Phillips Pet. Co.'s No. 1 W. Jackson (was Clark et al's No. 2) — Drlg. lime, 2,435 ft.
Phillips Pet. Co.'s No. 2 W. Jackson (was Clark et al's No. 3) — Drlg., 2,125 ft.
Phillips Pet. Co.'s No. 3 W. Jackson — Drlg., 920 ft.
Phillips Pet. Co.'s No. 1 Jackson-Riley (was Clark et al's No. 1 W. Jackson) — 7,000,000 ft. gas, 2,442-2,545 ft; cmtng. 8-in., 2,759 ft.
Phillips Pet. Co.'s No. 2 Jackson-Riley — Drlg., 712 ft.
Pampa Oil Co.'s No. 1 W. R. Campbell, Sec. 90, Blk. 3 — 700 ft. water, 3,430 ft; S.D
Purple Sage Oil Co.'s No. 2 E. B. Johnson — Material on ground.
Remo Oil Co.'s No. 1 B. E. McKinney — Location.
Rensoul Pet. Co.'s (was Salisbury & Reynolds') No. 1 M. Huselby, C SE NE NE, Sec. 55, Blk. 25, H. & G. N. Sur. — Flowing 30 bbls. daily; T.D., 2,950 ft; fish, 2 strings tools.
Shamrock Pet. Co. et al's No. 1 J. B. Back, SE NW SW, Sec. 44, Blk. 25 — T.D., 2,335 ft; rig burned and rebuilt; 30,000,000 ft. gas.
Shamrock Oil Co.'s No. 1 W. S. Clayton — New loc.
Skelly Oil Co.'s No. 1 Bradford, NE cor., Sec. 118, Blk. B-2, H. & G. N. Sur. — Drlg. water well.
Skelly Oil Co.'s No. 1 W. Jackson — Drlg., 2,300 ft.
Skelly Oil Co.'s No. 2 Jackson — Drlg., 840 ft.
Spartan Oil Co.'s No. 1 J. Hopkins — Building rig.
Sullivan et al's No. 1 A. Chapman — Rig on ground.
Sullivan et al's No. 1 A. Chapman-A — Rig; moving in tools.
Sun Oil Co.'s No. 1 W. Jackson — Rig.
Staggers Oil Co.'s (was Ruby Oil Co.'s) No. 1 B. F. Tally — T.D., 635 ft; S.D.
The Texas Company's No. 1 J. B. Bowers — Drlg., 1,720 ft.
The Texas Company's No. 2 J. B. Bowers — Drlg., 780 ft.
The Texas Company's No. 3 J. B. Bowers — Rig.
The Texas Company's No. 1 S. McLarty — Cellar.
The Texas Company's No. 4 G. H. Saunders — Drlg., 555 ft.
The Texas Company's No. 1 A. Chapman, Sec. 51, Blk. 25 — Fish., 2,790 ft.
J. Williams et al's No. 1 C. W. Bradford, Sec. 123, Blk. B-2 — Rig on ground; T.A.
Young et al's No. 1 Holmes — 3,352 ft; 2.00 ft. oil in hole (was comp. in Oct., 1926 for 300 bbls. at 3,135-80 ft.); drlg., 3,385 ft; some salt wtr. here.

HALE COUNTY

Bailey & Young's No. 1 Thomas, Sec. 1, Blk. J.K.L. — S.D., 175 ft.
Donnell Pet. Co.'s No. 2 Mullican, NW cor. Sec. 66, Blk. A-3, I. & S. B. Sur. — Top pay in sandy shale, 405 ft, ½ bailer oil and 3 bailers wtr per day; S.D., 620 ft.
Donnell Pet. Co.'s No. 1 Mullican, C Sec. 21, Blk. B, R. M. Thompson Sur. — 200 ft. fluid in hole from 407-14 ft; S.D.
Explt'n. Co.'s No. 1 Crawford, C NE, Sec. 17, Blk. C-3, T. T. R. R. Sur. — Spudded and S.D.
Explt'n. Co.'s No. 1 Goodman — Spudded and S.D.
A. S. Mimm's No. 1 W. A. Ritcher, 700 ft. from east line and 1,200 ft. from south line, Sec. 17, Blk. X, John Glynn Sur. — S.D., 1,140 ft.
Tolbert & Simms' (was Gouldy & Stone's) No. 1 Kitteral, SE cor. NW, Sec. 65, Blk. A-3, G. C. & S. F. Sur. — S.D., 485 ft.

HALL COUNTY

Briscoe Oil Assn.'s (was Seifert et al's) No. 1 Owens, C NE, Sec. 179, Blk. S-5, Dennison & Pacific Sur. — Spudded and S.D.

HANSFORD COUNTY

Caldwell et al's No. 1 J. Adriance est. — Rigged up and S.D.
Oklavania et al's No. 1 Coots, Sec. 13, Blk. 45, H. & T. C. Sur. — S.D., 560 ft.

HOCKLEY COUNTY

World Oil Co.'s No. 1 Ellwood — S.D., 1,420 ft.

HARTLEY COUNTY

Deep Rock Oil Co.'s No. 1 Lymann & Balfour, Sec. 9, — Preparing to abd., 4,038 ft.
Eslick et al's No. 1 J. R. Irving, Sec. 13, Blk. 13 — Topped granite wash, 3,103 ft. show oil, 3,226 ft; hole full wtr., 3,745-55 ft; S.D., 4,000 ft.

HEMPHILL COUNTY

Hoover et al's No. 1 Schaller est., Sec. 4 — Spudded and S. D.
Hoover et al's No. 1 fee, J. S. Hood Sur. — Run., 5-in. pipe to 4,820 ft; hard lime.

HUTCHINSON COUNTY

R. G. Barnum et al's No. 1 Garland Sanford, Sec. 78, Blk. 46 — Rig.
Beam et al's No. 1 Cockrell, Sec. 3, Blk. 23 — S.D., 405 ft. for orders.
Big Coach Oil Co.'s No. 1 Dunnaway, Sec. 5, Blk. Y — S.D., 750 ft.
Conklin et al's No. 1 Johnson, Sec. 1, Blk. X03, H. & O. B. Sur. — S.D., 600 ft.
McMan O. & G. Co.'s No. 1 Albert Yake — U.R., 10-in, 1,440 ft.
Phillips Pet. Co.'s No. 12 Elva-Whittenburg, E. Tomlinson Sur. — S.D. for orders, 4,445 ft.
Phillips Pet. Co. & White Eagle O. & R. Co.'s No. 1 Lee Bivins — Set 8-in. pipe, 2,808 ft.
Prairie O. & G. Co.'s No. 1 Burnett est. (Clark) — Drlg., 2,810 ft.
Prairie O. & G. Co. and Vacuum Oil Co.'s No. 2 Cal Merchant — Drlg., 920 ft.
Skelly Oil Co.'s No. 2 Armstrong & Byrd — Drlg. water well.
Skyrocket Oil Co.'s No. 1 Mrs. R. A. Jameson — Drlg., 2,915 ft; 15,000,000 ft. gas.
The Texas Company's No. 1 Cockrell-B — Drlg., 2,110 ft.
The Texas Co.'s No. 1 T. D. Lewis — Shot of 110 qts., 2,925-85 ft; top pay lime, 2,925 ft; T.D., 3,090 ft; 100 ft. wtr. in hole, from 3,080-90 ft.
Timms et al's No. 1 C. R. Garner — Fishing at 185 ft.

KING COUNTY

Humble O. & R. Co.'s No. 1 Pitchfork, Sec. 171, Blk. A-96, John H. Gibson Sur. — Drlg., 2,560 ft.
J. L. Pattison's No. 1 Patton — Slight show gas, 2,115-30 ft; S.D., 2,920 ft.

LAMB COUNTY

Dan Freel et al's No. 1 Ellwood, CWL, Sec. 9, Blk. T, T. A. Thompson Sur. — Rig.
Tolbert & Simms' No. 1 Elwood, NE SW SW, Sec. 14, Blk. B., R. M. Thompson Sur. — S.D., 712 ft; small show oil and hole full wtr; bailing.

LIPSCOMB COUNTY

Cal-Tex's No. 1 Bradford, C NE NE, Sec. 899, Blk. 43, H. & T. C. Sur. — Spudded and S.D.
Camp Creek Oil Co.'s No. 1 Mrs. H. D. May, Sec. 612, Blk. 43 — S.D., 1,400 ft.
McCorkle's No. 1 A. Barton, NE cor. SW SE, Sec. 504, Blk. 43, H. & T. C. Sur. — Water in lime at 4,126-40 ft; 6-in. set, 4,155 ft; S.D., 4,330 ft.
Ozark Drlg. Co.'s No. 1 Frass, NE SE, Sec. 106, Blk. 10, H. & T. C. Sur. — Rig on ground.
Smith, Kinsley & Ruby's No. 1 C. W. Jones, NE cor. SW, Sec. 100, Blk. 43 — Show oil, 3,520 ft; salt water at 3,900 ft; T.D., 4,020 ft; U.R. 8-in.

LUBBOCK COUNTY

Center Oil Co.'s No. 1 Bowles ranch — Small show oil, 1,133-40 ft., in sand; S.D., 2,000 ft.

MOORE COUNTY

A. O. Duggan's (was Shadler Bros.') No. 1 John Lowery, Sec. 237, Blk. 44 — Topped lime, 2,680 ft; set 8-in. at 2,770 ft; 4,000,000 ft. of gas, 2,980-3,020 ft; 15,000,000 ft. gas, 3,100-50 ft; (actual gauge); very slight show oil in lime; S.D., 3,652 ft.
Prairie and Shamrock's No. 2 Gober, Sec. 16, Blk. M-21 — T.D., 2,520 ft; recement 12-in. at 1,525 ft.

MOTLEY COUNTY

Explt'n. Co.'s No. 1 Burleson — Spudded and S.D.
Explt'n. Co.'s No. 1 Tillson — S.D., 750 ft. for repairs.
Explt'n. Co.'s No. 1 Matador Land & Cattle Co., C SW, Sec. 37, John Gibson Sur. — S.D., 1,002 ft.
Wheeler et al's No. 1 C. D. Bird, C NE, Sec. 4, Blk. S, Stephens Sur. — Spudded and S.D.

OLDHAM COUNTY

Prairie O. & G. Co.'s No. 1 Landegrin, SE cor. NE SW, Sec. 46, League 310, Capital land — 1,900 ft. wtr., 4,085-93 ft; 1 bailer wtr. per hr. and light scum oil, 4,527 ft. (steel line meas.) cmt. 6-in., 4,442 ft; 2,000 ft. salt wtr., 4,850-56 ft; T.D., 4,918 ft; U.R., 5-in.

POTTER COUNTY

Frank Allen et al's No. 1 W. H. Bush — Bldg. rig.
Prairie O. & G. Co.'s No. 1 Lee Bivins, 660 ft. N. and 330 ft. W. of SE cor., Sec. 39, Blk. M-20, G. & M. Sur. — Location.

ROBERTS COUNTY

Big Bend Oil Co.'s No. 1 Mrs. H. Ledrick & Sons, Sec. 7, Blk. 5-A — Show gas, 4,990 ft; show oil, 4,992 ft; cas. set, 4,992 ft; S.D., 5,145 ft.

SHERMAN COUNTY

Gibson Oil Co.'s No. 1 Bivins, Sec. 35, Blk. 3-B — 100,000 ft. gas, 2,016-26 ft; T.D., 3,353 ft; 2,000 ft. salt water, 3,325-33 ft; U.R., 6-in.
Phillips Pet. Co. and Prairie O. & G. Co.'s No. 1 Price & Fuqua, C NE, Sec. 33, Blk. 2-B, G. H. & H. Sur. — 100,000 ft. gas, 2,105-10 ft; T.D., 3,420 ft; 2,000,000 ft. gas, 3,325-3,420 ft. lime; rig burned.

WHEELER COUNTY

E. L. Arnold's No. 1 M. J. Williams — Show gas, 1,644 ft; T.D., 1,790 ft; fishing bit.
Byrens et al's No. 1 Johnson, SW cor. NE, Sec. 88, Blk. A-5, H. & G. N. Sur. — Drlg., 451 ft.
Clark et al's No. 1 J. W. Gordon — New location; rig.
Foster et al's No. 1 S. H. McDonald, SE cor. NW SW, J. N. Lindsay Sur. — Spudded.
Hatcher et al's No. 1 J. Hatcher, C NE SW, Sec. 80, Blk. 23, H. & G. N. Sur. — T.D., 1,460 ft; 1,000,000 ft. gas; cmt. 6-in.
Piney O. & G. Co.'s No. 1 W. S. Walker, Sec. 44, Blk. 24, H. & G. N. Sur. — Drlg., 1,370 ft. with crooked hole and rocked to 700 ft. to straighten.
Rook & Angus'No. 1 Smock (Linkey) C SE SE Sec. 5, Blk. 24, H. & G. N. Sur. — Rigged up and S.D.
Smith Brady et al's No. 1 P. J. Sorenson, Sec. 53, Blk. A-4 — S.D., 2,120 ft. for orders.
The Texas Company's No. 1 Morgan, Sec. 92, Blk. 17 — 21,000,000 ft. gas, 1,850-2,017 ft., S.D.
The Texas Company's No. 2 Morgan — Bldg. rig.
Vaughan et al's No. 1 M. Ackley — Location.
Pete Woodley's No. 1 J. Boyle — Rig.

WILDCAT OPERATIONS IN WEST TEXAS

(Continued from Page 55)

Texas Development Co.'s No. 1 J. Cowden — Top lime 2,635 ft.; repair. engine 3,860 ft.

CROCKETT COUNTY

George Anderson and Marland Oil Co.'s No. 1 University — Hole full sulphur water 1,800 ft.; ½ bailer oil 2,240 ft.; ½ bailer sulphur water per hour 2,475 ft.; shut down 2,631 ft.
V. T. Bolin & Co.'s No. 1 P. C. Coates, NW cor. SW Sec. 4, Blk. 2, I. & G. N. Sur. — Shut down 2,110 ft.
Corbett & Gill's No. 1 University — Top salt 855 ft.; smell gas 1,800 ft.; hole full sulphur water 1,985-90 ft.; drlg. 2,050 ft.
J. S. Cosden, Inc., No. 1 Paul Perner, SW cor. Sec. 36, Blk. 2, I. & G. N. Sur. — Drilling 500 ft.
Gulf Prod. Co.'s No. 3 Thompson — Drlg. 205 ft.
C. A. Jones et al's No. 1 Powell — Top salt 1,050 ft.; hole full water 2,245 ft.; drlg. 2,350 ft.
James Kelly et al's (was Corbett & Gill's) No. 1 Todd, C NE Sec. 43, Blk. WX, G. C. & S. F. Sur. — Top salt 993 ft.; show oil 1,948 ft.; 700 ft. sulphur water in hole 2,450 ft.; shut down 2,500 ft.
Van McPhail's No. 1 George Thompson — Location.
Van McPhail et al's No. 1 George Thompson — Location.
Magnolia Pet. Co.'s No. 2 Shannon — Show oil 2,385-90 and 2,992 ft.; total depth 4,100 ft.; fishing 20 joints 8-in. casing.
Osage Oil Corp.'s No. 1 H. M. Halff — Shut down 60 ft.; will skid rig.
Bob Penn's No. 1 L. P. Powell — Drlg. 1,020 ft.
William Shaffer et al's No. 1 University, C SE SE Sec. 9, Blk. 47, University Sur., elev. 2,344 ft. — Shut down 2,344 ft.
William Schaffer et al's No. 2 University, 1,350 ft. N and 2,610 ft. E of SW cor. Sec. 9, Blk. 47, University Land — Top salt 1,060 ft.; first oil show 2,190-96 ft.; second 2,225-29 ft.; 1 bailer oil in 10 hrs. at 2,590 ft.; shut down 2,635 ft.; brown lime.
Simmons Oil Co. et al's No. 1 H. M. Halff, NW cor. Sec. 69, Blk. 1, I. & G. N. — Top salt 445 ft.; drilling 545 ft.
W. W. Donnelly & Young's No. 1 Massey, Sec. 29, Blk. U-V — Shut down 150 ft.
McManmon Oil Co.'s No. 1 Blakeney — Drlg. 3,975 ft.
World Oil Co.'s No. 1 Schneeman-B, Sec. 50, Blk. BB, G. C. & S. F. Sur. — Top salt 1,070 ft.; hole full sulphur water 2,210-15; shut down 2,310 ft.
Young & Donnellys' No. 1 J. M. Shannon, C Sec. 11, Blk. 9, D. & S. E. Sur. — 6,000,000 ft. gas at 1,662 ft.; shut down 1,676 ft.

CULBERSON COUNTY

Deep Rock Oil Co.'s No. 2 Kloh-Rumsey, Sec. 21, Blk. 29, T. & P. Sur., T-1 (NE of No. 1) — Drlg. 1,000 ft.
James H. Gardner et al's No. 1 Radford, C SE Sec. 29, Blk. 62, Public School Land Sur. — Shut down 700 ft.
Scott & Dittman's No. 1 Miller, SW cor. NW NE Sec. 1, School Blk. 97 — Spudding 75 ft.

ECTOR COUNTY

The Texas Company and Cosden's No. 1 W. E. Connell, SE cor. Sec. 24, Blk. B-16, School Land — Top salt 925 ft.; drlg. 1,950 ft.

FISHER COUNTY

Cranfill & Reynolds' No. 1 J. A. Young, Sec. 208, B. B. B. & C. Sur. — Total depth 1,400 ft.; underream. 12-in.
Ideal Oil Co.'s No. 1 Jameson, C SE Sec. 111, Blk. 1, H. & T. C. Sur. — Hole full salt water 2,345-2,520 ft.; shut down 3,304 ft.
Marland Oil Co. and Texon's No. 1 McCall, Sec. 108, Blk 3, H. & T. C. Sur. — Rig.
R. W. Raney's No. 2 Maberry, Sec. 56, Blk. 1, T. & P. Sur. — Shut down for orders 2,725 ft.
The Texas Company's No. 1 D. S. Stevens, C SW SE SE Sec. 79, Blk. 1, H. & T. C. Sur. — Drlg. 2,100 ft.

FOARD COUNTY

Clark et al's No. 1 Atkins — Lime 1,580-1,930 ft.; show gas 1,885 ft.; drlg. 2,360 ft.

Fain-McGaha Oil Corp. et al's No. 1 Mathews ..... Total depth 2,550 ft.; plugged back to 1,506 ft.; swabbing sand 1,484-92 ft.; makes 8 bbls. gas dead oil.
The Texas Company's No. 1 Watkins ..... Drlg. 3,020 ft.

GAINES COUNTY

Westheimer & Daube's No. 1 Birge & Forbes Land Co., Sec. 308, Terrell County School Land ..... Cemented 8-in. 3,900 ft.; underream. 4,650 ft. (approx.).

GARZA COUNTY

Emerald Oil Co.'s No. 1 D. Boren, NW cor. N ESec. 137, Blk. 5, H. & G. N. Sur. ..... Small show oil in gray lime 1,884-1,902 ft.; shut down 2,600 ft.; show oil and hole full water 2,420-60 ft.
Gulf Prod. Co.'s No. 1 E. P. Swenson-A, Sec. 67, Blk. 2, H. & G. N. Sur. ..... Top salt 495 ft.; drlg. 960 ft.

GLASSCOCK COUNTY

Texon & Marland's No. 1 Settles ..... Rigging up to deepen; total depth 1,301 ft.

HOWARD COUNTY

California Co.'s No. 1 Fisher Bros., SE SW NW Sec. 36, Blk. 33, T. & P. Sur., T-1-S ..... Shows oil 1,530-48 ft. and 1,562-64 ft.; hole full water 2,020-34 ft.; hole full salt water 2,750-75 ft.; drlg. 2,915 ft.
Coyle-Concord Oil Co.'s No. 1 Dora Roberts ..... Cem. casing 1,588 ft.
Dixie Oil Co.'s No. 1 H. R. Clay ..... Shut down for repairs 2,222 ft.
Henshaw et al's No. 1 W. R. Settles, SW SE SW Sec. 135, Blk. 29 ..... Hole full sulphur water 1,335-80 ft.; total depth 1,900 ft.; shut down.
Marland Oil Co.'s No. 1 Clay-E, NW NE SE Sec. 138, Blk. 29 ..... Pay 2,480-2,500 ft.; swabbed approx. 160 bbls.; drlg. 3,030 ft., brown lime.
Marland Oil Co.'s No. 2 Clay-E ..... Rigging rotary.
Marland Oil Co.'s No. 1 Richardson, C NW Sec. 12, Blk. 32, T. & P. Sur., T-1-S ..... Drlg. 500 ft.
Marland Oil Co. and Zoch's No. 1 Jones, Sec. 32, Blk. 27, T. & P. Sur., elev. 2,218 ft. ..... Drlg. 800 ft.
Marland Oil Co.'s No. 1 A. M. Fisher, Sec. 1, Blk. 33, T. & P. Sur., T-2-S, elev. 2,730 ft. ..... Sulphur water 3,315-25 ft.; shut down for plug, orders 3,850 ft.
Mays, Nixon & Flowers' No. 1 W. J. Flowers ..... Rotary rig.
Miley and Marland Oil Co.'s No. 1 C. D. Read, C NW Sec. 12, Blk. 31, T. & P. Sur., T-1-N ..... Building rig.
Owens & Sloan's No. 2 Dora Roberts, SW cor. SE Sec. 136, Blk. 29 ..... Drlg. 1,600 ft.
Peer Oil Corp.'s No. 1 Read, C NW Sec. 39, Blk. 30, T. & P. Sur., T-1-N ..... Hole full salt water 2,790-2,820 ft.; shut down 3,000 ft.
Schermerhorn Oil Co.'s No. 1 Dora Roberts ..... Drlg. 980 ft.
Texon O. & L. Co. and Marland Oil Co.'s No. 1 Mrs. Connaly, NE cor. Sec. 15, Blk. 33, T. & P. Sur., T-1-S .. Top salt 1,425 ft.; hole full salt water 1,760-1,800 ft.; show oil 3,065 ft.; hole full sulphur water 3,500-55 ft.; drlg. 3,705 ft.
Vitek Oil Co.'s No. 1 H. R. Clay ..... Shut down 1,437 ft.
Ward Oil Co.'s No. 1 Dora Roberts ..... Rigging up rotary.

HUDSPETH COUNTY

American Land Co.'s (was Lockhart Bros.') No. 1 Gardner & Moseley, C SE Sec. 5, School Blk. 21 ..... Shut down 262 ft.
Western States Oil Co.'s (was Lockhart & Co.'s) No. 1 Moore, C SE Sec. 16, Blk. 71, T. & P. Sur., T-6 ..... Shut down for casing 900 ft.
Western States Oil Co.'s No. 1 Gardner & Mosley, Sec. 12, Blk. 18 ..... Rigged up and shut down.

IRION COUNTY

Cash Dollar et al's No. 1 G. J. Bird, NE Sec. 16, Blk. 10, S. P. R. R. Sur. ..... Shut down 2,500 ft.
F. E. Webb et al's No. 1 J. M. Nutt ..... Rigging up machine.

JEFF DAVIS COUNTY

J. K. Hughes Dev. Co.'s No. 2 Means ..... Drlg. 2,050 ft.
Humble O. & R. Co.'s No. 2 Crecencio Flores, 1,130 ft. N and 850 ft. E of SW cor. Sec. 34, Blk. 58, T. & P. Sur., Twp. 8 ..... Drlg. 2,485 ft.; hole full fresh water.

JONES COUNTY

Midwest Expl. Co.'s (was Campbell et al's) No. 1 L. H. Herndon, Sec. 6, M. E. P. & P. Sur., elev. 1,832 ft. ... Total depth 3,009 ft.; will shoot showings at 2,485-89 ft. and 2,558-61 ft.
Garland & Diamond's No. 1 E. D. Glynn, SE cor. Sec. 18, Deaf & Dumb Asylum Lands ..... Shut down 2,430 ft.
Gibson & Johnson's No. 1 R. J. Camp, S. M. Hale Sur. ... Drlg. 1,900 ft.
Hutson & Weaver's No. 1-A Smith ..... Total depth 1,980 ft. (cor.); shut down for casing.
Phillips Pet. Co.'s No. 2 J. C. Mason ..... Total depth 2,500 ft.; run. 6-in.
W. G. Stough et al's No. 1 W. C. Bennett, Sec. 42, Orphan Asylum Sur. ..... Shut down 800 ft.
W. G. Stough and others' No. 1 J. P. Willis, J. C. Patterson Sur. No. 2 ..... Shut down 1,740 ft.
Stebbins Oil and Sinclair O. & G. Co.'s No. 1 Scott ..... Total depth 1,945 ft.; underreaming.
Swensondale Oil Co.'s No. 1 Caton, SW NW Sec. 9, Deaf & Dumb Asylum Lands ..... Show oil 3,008-20 ft.; shot 80 qts., no results; drlg. 3,030 ft.

KNOX COUNTY

Deep Rock Oil Co.'s No. 1 Moore ..... Drlg. 500 ft.
Deep Rock Oil Co.'s No. 1 Big Four, 1,270 ft. S and 2,590 ft. W of NE cor. Sec. 31, Blk. 4 ..... Total depth 2,455 ft.; shut down.

LOVING COUNTY

Lockhart Bros.' No. 1 fee, Sec. 35, Blk. 33, H. & T. C. Sur. ..... Location.
Owens & Sloan's No. 1 W. D. Johnson, C SE Sec. 20, Blk. 53, T-2, T. & P. Sur., elev. 2,934 ft. ..... Shut down 1,020 ft.; in litigation

LYNN COUNTY

Elpo Oil Co.'s No. 1 Nevols, NW cor. Sec. 6, Blk. C-42, School Lands ..... Shut down 630 ft.

MIDLAND COUNTY

Orbit Oil Co.'s No. 1 Moreland, C SE Sec. 17, Blk. 39, T. & P. Sur., T-1-S ..... Shut down 185 ft.

MITCHELL COUNTY

Paul Teas et al's No. 1 A. C. Mills, NW cor. C. A. O'Keefe Sub. 11, J. P. Smith Sur. ..... Location.
Robert Thraves' No. 1 C. Way, Sec. 91, Blk. 27, T. & P. Sur., T-1-N ..... Total depth 2,508 ft.; shut down

NOLAN COUNTY

Herbert Oil Co.'s (was McClesky and others') No. 1 Pepper, SE cor. SW Sec. 29, Blk. 22, T. & P. Sur. ... Rigged up and shut down.
Winemiller Corp.'s (was Reiter-Foster Oil Co.'s) No. 1 T. E. Arledge, Sec. 217, Blk. 1, H. & T. C. Sur. ... Drlg. 300 ft.
Zweifel and others' No. 1 Longbotham, C SE Sec. 130, Blk. 1, H. & G. N. Sur. ..... Shut down 3,575 ft.

PECOS COUNTY

George Anderson's No. 1 Sherbine Bros. ..... Rig on ground.
Cummings et al's No. 1 Blackstone & Slaughter ..... Drlg. 1,370 ft.
M. C. Dibble & Hale's No. 1 Bonebrake, Sec. 115, Blk. 8, H. & G. W. Sur., elev. 2,555 ft. ..... Shut down 640 ft.
Garland & Mott's No. 1 El Paso Cattle Loan Co., C NE Sec. 26, Blk. 126, T. & S. L. Sur., elev. 3,267 ft. ..... Hole full sulphur water 2,560 ft Total depth 3,501 ft.; plug. back.
Gibson Oil Corp.'s No. 1 R. R. Russell ..... Rig.
George A. Henshaw et al's No. 1 B. T. Corder, C SW Sec. 74, Blk. 2, C. C. S. D. Sur. ..... Location.
George A. Henshaw, Jr., No. 1 Schimmel, Sec. 29, Blk. 144, T. & St. L. Sur., elev. 2,780 ft. ..... Hole full sulphur water 1,275-80 ft.; total depth 1,452 ft.
Kershaw & Livingston's No. 1 Cannon ..... Digging cellar.
Kirby Pet. Co. and Roxana's No. 1 W. W. Turney, NW cor. SW Sec. 11, Blk. 140, T. & St. L. Sur. ..... Hole full sulphur water 975-82 ft.; shut down 1,189 ft.
Mid-Kansas O. & G. Co.'s No. 1 Pryor & Wilson, NW cor. Sec. 3, Blk. 5, T. C. R. R. Sur. ..... Moving in machine.
Moody Oil Corp.'s No. 1 B. T. Corder, C SW Sec. 77, Blk. 2, C. C. S. D. Sur. ..... Rig.
Olean Pet. Co.'s No. 1 G. N. Harral, C SW Sec. 82, Blk. R-3, G. C. & S. F. Sur., elev. 1,005 ft. ..... 1,200 ft. salt water 2,965-78 ft.; shut down 2,995 ft.

Quinby Oil Co.'s No. 1 Townsite, Sec. 1, Blk. 267, Client Addn. Sur. Fort Stockton, elev. 2,980 ft. ..... Shut down 3,440 ft.
Quinby Oil Co.'s No. 2 Bennet, C NW 592, Blk. 105, G. C. & S. F. Sur., elev. 2,560 ft. ..... Shut down 1,457 ft.
Quinby Oil Co.'s No. 1 A. A. Gary, 660 ft. N and 1,320 ft. E SW cor. Sec. 593, Abst. 3,009, elev. 2,551 ft. .... Shut down 700 ft.
Red Bank Oil Co.'s No. 1 Arthur Harral ..... Rig on ground.
Robert Lee's No. 1 Joe Parker ..... Location.
B. J. Spikes' No. 1 George Brown ..... Rigging up machine.
Transcontinental Oil Co.'s No. 1 Blackston & Slaughter, Sec. 29, Blk. 129, F. St. L. Sur., elev. 3,539 ft. ..... 250 ft. sulphur water in black sand 1,150-80 ft.; small show oil 1,510 ft.; show gas 1,540 ft.; show oil 2,080 ft.; drlg. 3,210 ft., blue shale.
World Oil Co.'s No. 1 Kloh, Sec. 47, Blk. 48, Twp. 8, T. P. R. R. Sur., elev. 2,810 ft. ..... Rigging up.
World Oil Co.'s No. 1 Serf, SW cor. NE Sec. 10, Blk. 130, T. & St. L., elev. 3,245 ft. ..... Rigging up.

Yates Pool, Pecos County

(* denotes test in extension territory.)

*Allsman & Bell's No. 5 River Bed, 312 ft. N of No. 4 .... Location.
*Allsman & Bell's No. 11 River Bed ..... Spudding 50 ft.
California Co.'s No. 2 Yates, Sec. 34, Blk. 194 ..... Rig standing.
California Co.'s No. 6 Yates, Sec. 34, Blk. 194 ..... Drlg. 1,082 ft.
California Co.'s No. 7 Yates, Sec. 34, Blk. 194 ..... Stand. cem. 1,093 ft.
California Co.'s No. 8 Yates, Sec. 34, Blk. 194 ..... Cem. 10-in. 573 ft.
California Co.'s No. 4 Smith, Sec. 35, Blk. 194 ..... Drlg. 270 ft.
California Co.'s No. 5 Smith, Sec. 35 ..... Drlg. 280 ft.
California Co.'s No. 6 Smith, Sec. 35 ..... Building rig.
California Co.'s No. 7 Smith, Sec. 35 ..... Rig.
California Co.'s No. 8 Smith ..... Digging cellar.
California Co.'s No. 9 Smith ..... Location.
*Day Bros. & McKnight's No. 1 Yates, NW cor. Sec. 58, Blk. 1 ..... Top salt 440 ft.; shut down 630 ft.; tools in hole.
Gulf Prod. Co.'s No. 2 Smith, Sec. 28, Blk. 194 ..... Drlg. 1,215 ft.
Gulf Prod. Co.'s No. 3 Smith ..... Drlg. 15 ft.
Gulf Prod. Co.'s No. 4 Smith ..... Rigging up.
Gulf Prod. Co.'s No. 5 Smith ..... Building rig.
*Gulf Prod. Co.'s No. 1 Yates, Runnels Co. School Land .. Cem. 8-in. 1,254 ft.
*Gulf Prod. Co.'s No. 2 Yates, Runnels Co. School Land .. 2,000,000 ft. gas 1,231-35 ft.; flow. 712 bbls. 1,258-89 ft.
Humble O. & R. Co.'s No. 4 Smith ..... Drlg. 455 ft.
Humble O. & R. Co.'s No. 5 Smith-A ..... Building standard rig.
*Humble O. & R. Co.'s No. 1 Smith-B, Sec. 101, Blk. 194 .. Drlg. 530 ft.
*Humble O. & R. Co.'s No. 2 Smith-B, Sec. 101, Blk. 194 .. Flow. 159 bbls. hr. 1,315-1,422 ft.
Humble O. & R. Co.'s No. 3 Smith-B ..... Rig.
Kirby Pet. and Edson's No. 1 Tippett, Sec. 108, Blk. 194, elev. 2,547 ft. ..... Top lime 1,268 ft.; flow, 36 bbls. hr. 1,293-1,375 ft.
*Mazda and Savoy's No. 2 Smith, Sec. 24, Blk. 194 ..... Location.
*McMan and Marland's No. 10 Yates, Sec. 34½, Blk. 194 . Flow. 75 bbls. hr. 1,430 ft.
McMan and Marland's No. 11 Yates, Sec. 34½, Blk. 194 .. Drlg. 720 ft.
McMan and Marland's No. 12 Yates, Sec. 34½, Blk. 194 .. Drlg. 200 ft.
McMan and Marland's No. 13 Yates ..... Rigging up.
McMan and Marland's No. 14 Yates ..... Location.
Marland Oil Co.'s No. 5 Yates-A, Sec. 60, Blk. 1 ..... Drlg. 420 ft.
Marland Oil Co.'s No. 6 Yates-A, Sec. 60, Blk. 1 ..... Stand. cem. 857 ft.
Marland Oil Co.'s No. 7 Yates-A, Sec. 60, Blk. 1 ..... Drlg. 840 ft.
Marland Oil Co.'s No. 8 Yates-A, Sec. 60, Blk. 1 ..... Drlg. 405 ft.
Marland Oil Co.'s No. 9 Yates-A ..... Rigging up.
Marland Oil Co.'s No. 10 Yates-A ..... Building rig and rigging up.
Mid-Kansas and Transcontinental's No. 8 Yates-A, Sec. 33½, Blk. 194 ..... Drlg. 330 ft.
Mid-Kansas and Transcontinental's No. 9 Yates-A, Sec. 33½, Blk. 194 (W of No. 2) ..... Drlg. 982 ft.; 20,000,000 ft. gas.
Mid-Kansas and Transcontinental's No. 10 Yates-A, Sec. 33½, Blk. 194 (N of No. 1) ..... Waiting for machine.
*Mid-Kansas and Transcontinental's No. 11 Yates-A, Sec. 33½, Blk. 194 (S of No. 1) ..... Drlg. 125 ft.
Mid-Kansas and Transcontinental's No. 12 Yates-A ..... Waiting on machine.
Mid-Kansas and Transcontinental's No. 13 Yates-A ..... Rigging up; waiting on machine.
Mid-Kansas and Transcontinental's No. 14 Yates-A ..... Rigging up; waiting on machine.
Mid-Kansas and Transcontinental's No. 15 Yates-A ..... Location.
Mid-Kansas and Transcontinental's No. 7 Yates-B, Sec. 61, Blk. 1 ..... Drlg. 850 ft.
Mid-Kansas and Transcontinental's No. 8 Yates-B, Sec. 61, Blk. 1 ..... Drlg. 993 ft.; flow. 10 bbl. hr. with 10,000,000 ft. gas.
Mid-Kansas and Transcontinental's No. 10 Yates-B, Sec. 61, Blk. 1 ..... Clearing location.
Mid-Kansas and Transcontinental's No. 11 Yates-B ..... Digging cellar.
*Mid-Kansas and Transcontinental's No. 12 Yates-B ..... Location.
Mid-Kansas and Transcontinental's No. 13 Yates-B ..... Drlg. 140 ft.
Mid-Kansas and Transcontinental's No. 14 Yates-B ..... Drlg. 160 ft.
Mid-Kansas and Transcontinental's No. 15 Yates-B ..... Show oil 605-10 ft.; drlg. 200 ft.
Mid-Kansas and Transcontinental's No. 16 Yates-B ..... Show gas 168 ft.; drlg. 200 ft.
Mid-Kansas and Transcontinental's No. 17 Yates-B ..... Clearing location.
Mid-Kansas and Transcontinental's No. 18 Yates-B ..... Clearing location.
Mid-Kansas and Transcontinental's No. 19 Yates-B ..... Wait. for machine.
Mid-Kansas and Transcontinental's No. 20 Yates-B ..... Location.
Mid-Kansas and Transcontinental's No. 21 Yates-B ..... Location.
Mid-Kansas and Transcontinental's No. 22 Yates-B ..... Location.
Mid-Kansas and Transcontinental's No. 4 Yates-C, Sec. 60, Blk. 1 ..... Waiting on machine.
Mid-Kansas and Transcontinental's No. 5 Yates-C ..... Stand. at 1,130 ft.; flow. 2,405 bbls. fluid in 15 hrs., 25 per cent water.
Mid-Kansas and Transcontinental's No. 6 Yates-C ..... Waiting on machine.
Mid-Kansas and Transcontinental's No. 7 Yates-C ..... Drlg. 550 ft.
Mid-Kansas and Transcontinental's No. 8 Yates-C ..... Rigging up.
Mid-Kansas and Transcontinental's No. 9 Yates-C ..... Location.
Mid-Kansas and Transcontinental's No. 10 Yates-C ..... Location.
Mid-Kansas and Transcontinental's No. 1 Yates-D, Sec. 62, Blk. 1 ..... Flowed 1,090 bbls. in 12 hrs. Saturday; fish, 1,330 ft. for bit; top pay 1,063 ft.
Mid-Kansas and Transcontinental's No. 2 Yates-D, SW part Sec. 62, Blk. 1 ..... Cellar; waiting for machine.
*Mid-Kansas and Transcontinental's No. 1 Yates-E, C W Sec. 59, Blk. 1 ..... Stand. cem. 901 ft.
Mid-Kansas and Transcontinental's No. 3 Smith-Taylor, Sec. 33, Blk. 194 ..... Total depth 1,420 ft.; completed.
Mid-Kansas and Transcontinental's No. 4 Smith-Taylor, Sec. 33, Blk. 194 ..... Drlg. 820 ft.
Mid-Kansas and Transcontinental's No. 5 Smith-Tayler .. Drlg. 560 ft.
Mid-Kansas and Transcontinental's No. 6 Smith-Taylor .. Drlg. 470 ft.
Mid-Kansas and Transcontinental's No. 7 Smith-Taylor .. Location.
Mid-Kansas and Transcontinental's No. 8 Smith-Taylor .. Location.
Mid-Kansas and Transcontinental's No. 9 Smith-Taylor .. Location.
*Red Bank Oil Co.'s No. 2 Smith, Sec. 24, Blk. 194 ..... Show gas 1,019-27 ft.; top pay 1,515 ft.; shut down 1,557 ft. (cor.); flow. 30 bbls. hr.
*Roxana Pet. Corp.'s No. 3 Tippett, Sec. 102, Blk. 194 .... Cem. 1,490 ft.
Roxana Pet. Corp.'s No. 4 Tippett ..... Rigging up.
Roxana Pet. Corp.'s No. 2 Smith, SE cor. SW Sec. 27, Blk 194 ..... Shut down for water 1,125 ft.
Roxana Pet. Corp.'s No. 3 Smith ..... Digging cellar.
Simms Oil Co's No. 3 Smith, Sec. 103, Blk. 194 ..... Top lime 1,138 ft.; flow. 413 bbls. in 30 min. at 1,187-97 ft.
Simms Oil Co.'s No. 4 Smith, Sec. 103, Blk. 194 ..... Ream. 640 ft.
Simmons et al's No. 1 ..... Drlg. 190 ft.
Layne-Tex Oil Co.'s No. 1 ..... Pull. 12-in. 60 ft.

PRESIDIO COUNTY

Meadlock & Miller's No. 1 Tootie Est., Sec. 123, Blk. 3, D. & P. Sur., elev. 2,912 ft. ..... Salt water 2,610 ft.; total depth 3,003 ft.; shut down for orders.
Pinto Canyon Oil Co.'s No. 1 Fields, 1,760 ft S and E NW cor. Sec. 74, Blk. 2, D. & P. Sur. ..... Location.

REAGAN COUNTY

Henshaw & Camp's No. 1 University, Sec. 14, Blk. 49, University Land, elev. 2,772 ft. ..... 250 ft. sulphur water at 800 ft.; fish, pipe 2,080 ft.
Skelly Oil Co.'s No. 1 University, SW cor. Sec. 33, Blk. 8, University Land ..... Top salt 1,340 ft.; drilling 2,240 ft.
Texon O. & L. Co.'s No. 1-B University, Group 1 ..... Top pay 6,254 ft.; total depth 6,590 ft.; 3,800 ft. of 38.7 gravity oil in hole; shut down.

White et al's No. 1 Shofner & Sterling, SE cor. NW Sec. 10, 2 m. N of Big Lake ..... Shut down 670 ft.

REEVES COUNTY

Exploration Co.'s No. 1 A. A. Kinney, 1,500 ft. W of NE cor. Sec. 26, Blk. C-18, Public School Land, elev. 2,847 ft. ..... Show oil 1,105-10 ft.; drlg. 1,245 ft. 12-in

Grisham-Hunter Corp.'s No. 1 Rathge & Connor ..... Moving in machine.
David R. Thompson's No. 1 A. A. Eddins ..... Drlg. 3,580 ft.
World Oil Co.'s No. 1 Biggs, C SE Sec. 65, Blk. 112, Public School Land Sur., elev. 3,068 ft. ..... Shut down 1,610 ft.
World Oil Co.'s No. 1 Duff, elev. 2,753 ft. ..... Top Delaware lime 4,185 ft.; hole full brackish salt water 4,368-4,500 ft.; plug. back to 4,250 ft. to shoot.

RUNNELS COUNTY

Empire G. & F. Co.'s No. 1 C. C. Clay ..... Run. casing 1,170 ft.
Gibson & Johnson's No. 1 Harris Est., Juliana Voske Cabrera Sur. ..... Location.
Gibson & Johnson's No. 1 H. P. Serratt, C SE NW Sec. 150, E. T. R. R. Sur. ..... Building rig.
Kennedy et al's No. 1 J. E. Tally ..... Shut down 1,720 ft.
May et al's No. 1 J. M. Schneider, John Wall Sur. ..... One-half bailer salt water 1,032 ft.; fish. casing 1,056 ft.

Miles Oil Co.'s No. 1 Charles Ray, Sec. 21, T. & N. O. Sur. ..... Cellar.
Miles Oil Co.'s No. 1 L. S. Lawhon, NE cor. Sec. 68 ..... Show gas 960-80 ft.; drlg. 2,250 ft.
Noble O. & G. Co.'s No. 1 Sims, Sec. 12, J. J. McHenry Sur. ..... Hole full sulphur water 2,710 ft. and hole full salt water 2,820 ft.; drlg. 2,830 ft.

Royal Pet. Co.'s No. 1 A. C. Willingham ..... Location.
Swensondale Oil Co.'s No. 1 E. A. Werner ..... Drlg. 1,730 ft.
Owenwood Oil Corp.'s No. 1 H. B. Fowler ..... Location
Watchorn O. & G. Co.'s No. 1 J. L. King ..... Spudding.

SCHLEICHER COUNTY

Beavers & Leath et al's No. 1 J. A. and W. T. Whitten, C NW Sec. 35, Blk. 11, T. O. Sur. ..... Shut down 400 ft.
Thomas Grey et al's No. 1 Ball Robinson, C NW Sec. 25, Blk. M, G. H. & S. A. Sur. ..... Sulphur water 2,125 ft.; hole full water 2,160-80 ft. and 2,935 ft.: Total depth 3,004 ft.; underream. 6-in. casing.

SCURRY COUNTY

J. B. Mims et al's No. 1 J. J. Koonsman, Sec. 220, Blk. 3, H. & T. C. Sur. ..... Location.

STERLING COUNTY

Orr et al's No. 1 Neal Reed, CNL Sec. 15, Blk. 30, W. & N. W. Sur. ..... Shut down 1,390 ft.: (corrected).

STONEWALL COUNTY

Pear Oil Corp. and Producers Oil Co.'s (was J. P. Johnson's) No. 1 R. P. Morrow ..... Hole full water 2,625-90 ft.; set 10-in. 2,700 ft.; drlg. 2,985 ft.

TAYLOR COUNTY

A. J. Brown et al's No. 1 Henslee, NE cor. Sec. 5, Blk. 4, S. P. R. R. Sur. ..... Fish. 2,265 ft.
Dorning & Perrine's No. 1 J. A. Hammer, C N 100 acres, Sec. 23, Blk. 19, T. & P. Sur., elev. 1,904 ft. ..... Shut down 455 ft.
Gilbert Johnson and Day Bros.' No. 1 C. M. Brown, Sec. 1, Blk. 6, T. & P. Sur. ..... Drlg. 660 ft.
Owen & Sloan's No. 1 Lattimer, Sec. 14, Blk. 9, T. & P. Sur. ..... Shut down 2,605 ft.
Roeser & Pendleton's No. 1 Sam Hutman, C W half NW Sec. 64, Blk. 5, T. & P. Sur. ..... Water sand 2,222 ft.; fishing 2,714 ft.

TERRELL COUNTY

Milham Exploration Co.'s No. 1 Bassett, CNL Sec. 99, Blk. Y, W. H. Robertson Sur. ..... Rig on ground.

TERRY COUNTY

Kingsland O. & P. Co.'s No. 1 Brownsfield, C NW SW SW Sec. 7, Blk. 1-A, E. L. R. R. Sur. ..... Slight show gas 2,230 ft.; shut down 3,207 ft. (S. L. M. corrected); contract completed.

TOM GREEN COUNTY

George Amery's No. 1 Wilkey, C SW Sec. 3, B. A. L. Sur. ..... Location.
Cox et al's No. 1 Llano ..... Total depth 470 ft.; shut down
Fitzgerald et al's No. 1 Bennett ..... Drilling 1,625 ft.
Mariand Oil Co.'s No. 1 J. W. Johnson, C SE, Sec. 6, B. B. Sanderson Sur. ..... Hole full water 2,020-45 ft.; drlg. 2,160 ft.
Mariand Oil Co.'s No. 1 J. W. Johnson-A ..... Drlg. 930 ft.
Tulsa Oil Co.'s No. 1 Adams, C SW Sec. 163, Blk. 11, S. P. R. R. Sur. ..... Fishing tools 900 ft.

UPTON COUNTY

Mark Curtis et al's (was Hultz et al's) No. 2 Giddings, 5,336 ft. S and 6,678 ft. E of NW cor. Throckmorton Co. School Land, League 1, elev. 2,757 ft ..... Drlg. 450 ft.
Skelly Oil Co.'s No. 1 J. F. Lane, SW cor. SE SE Sec. 3, G. C. & S. F. Sur. ..... Top salt 569 ft.; drlg. 1,080 ft.
Southern C. O. P. Co.'s No. 1 C. W. Hobbs ..... Drlg. 1,650 ft.
The Texas Company and Cordova Union's No. 1 Union Land, Sec. 23, Blk. 35, H. & T. C. ..... Top pay 2,098 ft.; swabbed 60 bbls. in 36 hrs. at 2,271 ft., 2 per cent water.

Tulsa Drlg. Co.'s No. 1 W. A. Chaney, Sec. 18, Blk. 3, M. K. T. Sur. ..... Top salt 670 ft.; show oil 2,090 ft.; drlg. 2,250 ft.

Wise & Jackson's No 1 J. H. Porter, SW cor. SW SW Sec. 184, Blk. E, elev. 2,592 ft. ..... Top pay 3,419 ft.; total depth 3,519 ft., gray lime; shut down.

VAL VERDE COUNTY

A. Blume et al's No. 1 Moore Est., Sec. 183, J. Mitchell Sur., elev. 953 ft. ..... Shut down 3,000 ft.
Curse Williams' No. 1 Holman, NE NE Sec. 5, Blk. N, G. H. & S. A. Sur. ..... Shut down 2,940 ft.
Douglas Oil Co.'s No. 1 Sellars, C SE Sec. 82, Blk. A, I. & G. N. Sur. ..... Drlg. 4,100 ft.
East Del Rio Oil Co.'s No. 1 Russell, SE cor. Sec. 183, Del Rio Town Sur., elev. 941 ft. ..... Total depth 3,190 ft.; shut down
Magnolia Pet. Co.'s No. 1 Whitehead, Sec. 81, D. G. C. & S. F. Sur., elev. 1,770 ft. ..... Drlg. 4,890 ft.
Independent Operators' No. 1 Whitehad, SE SE Sec. 80, Blk. 4, I. & G. N. Sur., elev. 1,175 ft. ..... Shut down 3,900 ft.
O. O. Owens' No. 1 Mills, Sec. 128, Blk. 1, I. & G. N. Sur., elev. 2,130 ft. ..... Gas sand 2,491-2,520 ft.; tested 125,750 ft. gas; reset 8-in. 2,511 ft.; drlg. 2,890 ft.

WINKLER COUNTY

Amerada Pet. Corp.'s No. 1 J. B. Walton, SW cor. NW Sec. 48, Blk. 26, elev. 2,833 ft. ..... Top salt 1,086 ft.; 2,500,000 ft. gas 1,700-08 ft.; killed gas with 3½ tons baroid; cored brown lime carrying oil 2,334 ft.; standardized and drilling ahead.

Atlantic O. P. Co.'s No. 1 Ida Hendrick, SE cor. W half NE Sec. 44, Blk. 26 ..... Show gas 2,770 ft.; drlg. 2,835 ft.; flowed 50 bbls.
Atlantic O. P. Co.'s No. 1 Grisham-Hunter, Sec. 34, Blk. B-5 ..... Top pay 2,826 ft.; increase 2,837-43 ft.; drlg. 2,950 ft.; aver. 1,308 bbls. past week; flowed 710 bbls. Sunday.

Atlantic O. P. Co.'s No. 2 Grisham-Hunter ..... Total depth 2,535 ft.; reaming.
Atlantic O. P. Co.'s No. 1 Grisham-Hunter-C (was Lemar) ..... Drlg. 2,275 ft.
Atlantic O. P. Co.'s No. 1 Ida Hendrick-D ..... Standardizing 2,559 ft.
Atlantic O. P. Co.'s No. 1 Grisham-Hunter-E ..... Shut down 1,192 ft.; lost rotary returns.
V. T. Bolin et al's No. 1 Brown ..... Spudded and shut down.
Magnolia Pet. Co.'s (was G. M. Church et al's) No. 1 Ida Hendrick, Sec. 29, Blk. B-5 ..... 1,000,000 ft. gas 2,560 ft.; 2,000,000 ft. gas 2,610 ft.; 1,000 ft. oil in hole 2,713-66 ft.; connecting up.

Magnolia Pet. Co.'s (was G. M. Church et al's) No. 2 Ida Hendrick ..... Stand. cem. 2,519 ft.
Magnolia Pet. Co.'s No. 3 Ida Hendrick ..... Drilling 700 ft.
Cranfill Bros. and California Co.'s No. 1 M. J. Bashara, at cor. Secs. 10, 11, 22 and 23, School Blk. 77 ..... Total depth 3,318 ft., cored lime and anhydrite showing oil.

Cranfill & Reynold's No. 2 Ida Hendrick-A, C SE NW NW Sec. 28, Blk. B-5 ..... Flowed 1,500 bbls. 2,850-2,983 ft.
Cranfill & Reynold's No. 1 Grisham-Hunter-B, Sec. 35, Blk. B-5 ..... Drlg. 2,360 ft.
Eastland Oil Co. and Arnold's No. 1, Sec. 35, Blk. B-5 ... Straightening hole 2,484 ft.
Gulf Prod. Co.'s No. 3 T. G. Hendrick ..... 250,000 ft. gas 2,623-25 ft.; drlg. 2,866 ft.; made 2 small heads oil.
Gulf Prod. Co.'s No. 5 T. G. Hendrick ..... Show oil 2,635-40 ft.; 25,000,000 ft. gas 2,779 ft.

Gulf Prod. Co.'s No. 6 T. G. Hendrick, NE cor. NW Sec. 34 ..... 4,000,000 ft. gas 2,718-20 ft.; sprayed 20 bbls.; drlg. 2,825 ft.; 8,000,000 ft. gas.

Humble O. & R. Co.'s No. 1 T. G. Hendrick, NW cor. NE Sec. 34, Blk. B-5, Public School Land, elev. 2,816 ft. ..... Total depth 2,763 ft.; fished out one bit; gas which had been killed broke loose again; shut down.
Humble O. & R. Co.'s No. 3 Hendrick, Sec. 34, Blk. B-5.. 5,000,000 ft. gas from 2,194 ft.; total depth 2,370 ft.; fishing drill stem.
Humble O. & R. Co.'s No. 4 Hendrick, Sec. 34 ..... 5,000,000 ft. gas from 2,252 ft. 15,000,000 ft. at 2,667 ft.; flowed 2,232 bbls. 2,866-90 ft.

Humble O. & R. Co.'s No. 1 Ida Hendrick-B ..... Drlg. 2,682 ft.
Humble O. & R. Co.'s No. 2 Ida Hendrick-B ..... Rig on ground.
Humble O. & R. Co.'s No. 3 Ida Hendrick-B ..... Drlg. 2,500 ft.
Independent O. & G. Co.'s No. 1 J. S. Howe-D, NE cor. W half SE Sec. 44, Blk. 26 ..... Top pay 2,846 ft.; shut down for storage 2,940 ft.; hole full oil.

Independent O. & G. Co.'s No. 1 Hendricks-A, elev. 2,816 ft. ..... Flowed 7,677 bbls. at 2,878-79 ft.; pinched to 1,435 bbls.

Independent O. & G. Co.'s No. 2 Hendricks-A, elev. 2,822 ft. ..... Show gas 2,620 ft.; drlg. 2,770 ft.
Independent O. & G. Co.'s No. 1 Vardeman-B ..... Drlg. 853 ft.
Independent O. & G. Co.'s No. 2 Vardeman-B ..... Cellar.
Liner Drlg. Co.'s No. 1 Seth-Campbell, NE cor. Sec. 2, Blk B-5 ..... Shut down 450 ft.
Landreth Prod. Corp.'s No. 1 Hendrick-A, SE cor. SW Sec. 29, Blk. B-5 ..... Top lime 2,663 ft.; show oil 2,688 ft. and 2,875 ft.; 1,400 ft. oil 2,925 ft.; 200 ft. sulphur water 3,009-13 ft.; water exhausted; filled hole up to 2,950 ft. with gravel; making 3 bailers oil hr.

Landreth and Roxana's No. 2 Ida Hendrick-A, Sec. 29, Blk. B-5 ..... Part rigged and shut down.
Landreth and Roxana's No. 3 Ida Hendrick-A, Sec. 29, Blk. B-5 ..... Part rigged and shut down
Landreth and Roxana's No. 4 Ida Hendrick-A ..... Standardizing 2,587 ft.
Murchison Oil Co. et al's (was Mariand Oil Co.'s) No. 1 Grisham-Hunter-B ..... Location.
Murchison Oil Co. et al's (was Mariand Oil Co.'s) No. 2 Grisham-Hunter-B ..... Total depth 2,890 ft.; reinstalling rotary.

Murchison Oil Co. et al's (was Mariand Oil Co.'s) No. 3 Grisham-Hunter-B ..... Showing oil 2,630 ft.; total depth 2,427 ft.; tore down standard rig; standing cemented.

Murchison Oil Co. et al's (was Mariand Oil Co.'s) No. 4 Grisham-Hunter-B ..... Drilling 2,615 ft.
Mining & Engineering Co.'s No. 1 T. G. Hendrick, Sec. 10, Blk. B-12 ..... Partly rigged up and shut down.
Murchison Oil Co. and Cranfill Bros.' No. 2 Grisham-Hunter ..... Location.
Murchison Oil Co. and Cranfill Bros.' No. 4 Grisham-Hunter ..... Location.
Pure Oil Co.'s No. 2 Hendrick, elev. 2,827 ..... Top salt 1,518 ft.; top lime 3,390 ft.; made 20-bbl. head at 2,635-43 ft.; 1,200 ft. oil in hole 2,657-80 ft.; shut down 2,770 ft.; hole full oil.

Pure Oil Co.'s No. 3 Hendrick, NE cor. SW Sec. 41, Blk. B-5 ..... Cem. 8-in. 2,360 ft.
Pure Oil Co.'s No. 1 Hendrick-B, NE cor. SE Sec. 34, Blk. B-5 ..... Show gas 2,350-60 ft.; show oil 2,380 ft.; 15,000,000 ft. gas at 2,490 ft.; more gas 2,564 ft.; 40,000,000 ft. gas at 2,720 ft.; shut down.
Pure Oil Co.'s No. 2 Hendrick-B ..... Top lime 2,387 ft.; standardized 2,387 ft. and shut down.
Pure Oil Co.'s No. 3 Hendrick-B ..... Cem. 8-in. 2,438 ft.; rigging up.
Pure Oil Co.'s No. 4 Hendrick-B ..... Location.
Republic Prod. Co.'s No. 1 Grisham-Hunter-A, NW cor. E half SW Sec. 45, School Block 26 ..... Top lime 2,440 ft.; 15,000,000 ft. gas at 2,775 ft.; shut down for orders.

Republic Prod. Co.'s No. 1-A Grisham-Hunter-B, SW cor. E half SE Sec. 41, Blk. B-5 ..... Run. 8-in. 2,288 ft.
Republic Prod. Co.'s No. 2 Grisham-Hunter-B ..... Drlg. 2,200 ft.
Roxana Pet. Corp.'s No. 1 Grisham-Hunter-A, SW cor. E half NW Sec. 45, School Blk. 26 ..... Top lime 2,428 ft.; little gas; show oil and gas 2,570 ft.; increase gas at 2,597 ft.; spraying oil 2,760-65 ft.; 65,000,000 ft. gas 2,800-01 ft.; blew tools up in hole; gas broke gauge at 59,500,000 ft.; started spraying little oil Nov. 21.

Roxana Pet. Corp.'s No. 1 Grisham-Hunter-B, SW cor. S half SE Sec. 29, Blk. B-5 ..... Top lime 2,657 ft.; show oil and gas 2,630 ft.; shut down 3,002 ft.; fish. out tools.

Roxana Pet. Corp.'s No. 1 Grisham-Hunter-C, NW of Sec. 29, Blk. B-5 ..... 1,300 ft. oil 2,692-95 ft.; flowed 980 bbls. in 1 hr. 2,885 ft.; flowed 3,026 bbls. through ⅝-in. choke.

Roxana Pet. Corp.'s No. 2 Grisham-Hunter-C, SE cor. N half NW Sec. 29, Blk. B-5 ..... Rigging up rotary.
Roxana Pet. Corp.'s No. 1 Grisham-Hunter-D, SW cor. S half NE Sec. 41, Blk. B-5 ..... Drlg. 2,345 ft.
Roxana Pet. Corp.'s No. 2 Grisham-Hunter-D ..... Location.
Sheldon & Burden's No. 1 Ida Hendrick, SW cor. SE Sec. 28, Blk. B-5 (10-a. tract) ..... Top salt 1,260 ft.; drlg. 1,750 ft.; shot 150 qts. 2,950-3,025 ft.; flowed 1,800 bbls. first 17 hrs.

Southern C. O. P. Co.'s No. 3 T-67 Hendrick-C, SE cor. NE Sec. 33, Blk. B-5, elev. 2,816 ft. ..... Top first pay 2,735 ft.; second pay 2,934-62 ft.
Southern C. O. P. Co.'s No. 4 T-67 Hendrick-C, elev. 2,810 ft. ..... Drlg. 2,820 ft.
Southern C. O. P. Co.'s No. 2 Ida Hendrick T-88-B ..... Total depth 2,659 ft.; cem. 6-in. in lime; stand. cem.
Southern C. O. P. Co.'s No. 1 T-89 Grisham-Hunter-A, CWL NE SW Sec. 35, Blk. B-5, elev. 2,816 ft. ..... Top salt, 1,219 ft; top lime, 2,298 ft.; 10,000,000 ft. gas 2,473-75 ft.; 3,000,000-ft. increase at 2,485 ft.; spraying oil from 2,685 ft.; shot 300 qts. 2,480-2,685 ft. to shoot bit loose; flowed 50 bbls. with 30,000,000 ft. gas.

Southern C. O. P Co.'s No. 2 T-89 Grisham-Hunter-A, Sec. 35, Blk. B-5 ..... Top salt 1,189 ft.; drilling 1,760 ft. gas.
Southern C. O. P. Co.'s No. 3 T-89-A Grisham-Hunter-A.. Drlg. 630 ft.
Southern C. O. P. Co.'s No. 4 T-89-A Grisham-Hunter-A. Location.
Texon O. & L. Co.'s No. 1 Grisham-Hunter-A, SW cor. SE Sec. 41, Blk. B-5 ..... Total depth 2,814 ft.; flowing 645 bbls.; rigging up to deepen.
Texon O. & L. Co.'s No. 2 Grisham-Hunter-A ..... 5,000,000 ft. gas 2,260-2,900 ft.; 15,000,000 ft. gas 2,646-56 ft.; fishing tools 2,670 ft.

Texon O. & L. Co.'s No. 3 Grisham-Hunter-A, NW cor. W half SE Sec. 41, Blk. B-5 ..... Cem. 8-in. 2,140 ft.; standardizing.

Texon O. & L. Co.'s No. 1 Grisham-Hunter-B, NW cor. W half SW Sec. 45, School Blk. 26	Shut down 1,150 ft. to install rotary.
Texon O. & L. Co.'s No. 2 Grisham-Hunter-B	Rigging up rotary.
White Eagle O. & R. Co.'s (was Gibson & Johnson's) No. 1 P. A. Lock, 1,320 ft. W of NE cor. Sec. 30, Blk. 74, NW of discovery well, elev. 2,830 ft.	Total depth 3,260 ft.; tools and bailer in hole; drlg. out cement.
Southern C. O. P. Co.'s No. 1 Ida Hendrick 3-T-67-A, C SW NW NE Sec. 4, Blk. B-12, elev. 2,784 ft.	Top lime 2,638 ft.; slight show oil 3,000-08 ft.; filled up 1,500 ft. sulphur water at 3,065-72 ft.; plugged back to 3,050 ft. and shut off water; will shoot in future; flows 5 bbls. daily.
Southern C. O. P. Co.'s No. 2 Ida Hendrick 3-T-67-A	Standing cemented 2,646 ft.; tore down rotary.
Southern C. O. P. Co.'s No. 1 T-67 Hendrick-B, NE cor. SE Sec. 24, Blk. 26	Top salt 2,210 ft.; top lime 2,645 ft.; total depth 2,648 ft.; rigged tools and shut down.
Southern C. O. P. Co.'s No. 1 Hendrick 3-T-68-A, SW cor. W half NW Sec. 35, Blk. B-5	Top salt 1,365 ft.; top lime 2,367 ft.; top pay 2,440 ft.; drilling 2,711 ft. makes 20 bbl. head every day.
Southern C. O. P. Co.'s No. 2 Hendrick 3-T-68-A	Standardized 2,288 ft. and shut down.
Southern C. O. P. Co.'s No. 3 Hendrick 3-T-68-A	Cem. 8-in. 2,118 ft.
Southern C. O. P. Co.'s No. 1 T-88 Ida Hendrick-C, NW cor. Sec. 28, Blk. B-5	6,000,000 ft. gas 2,665 ft.; drlg. 2,850 ft.
Southern C. O. P. Co.'s No. 2 T-88 Hendrick-C, Sec. 28, Blk. B-5	Cem. 6-in. 2,435 ft.; standardized.
Southern C. O. P. Co.'s No. 3 Ida Hendrick, T-88-C	Standardized 2,499 ft.
Southern C. O. P. Co.'s No. 4 Ida Hendrick, T-88-C	Drlg. 1,012 ft.
Southern C. O. P. Co.'s No. 5 Ida Hendrick, T-88-C	Drlg. 500 ft.
Southern C. O. P. Co.'s No. 6 Ida Hendrick, T-88-C	Drlg. 570 ft.
Southern C. O. P. Co.'s No. 7 Ida Hendrick, T-88-C	Drlg. 1,010 ft.
Turman & Maxwell's No. 1 Ida Hendrick	Shut down for tankage 2,879 ft., flows at out 70 bbls. and 5,000,000 ft. gas.
Turman & Maxwell's No. 2 Ida Hendrick	Cem. 6-in. 2,452 ft.
Turman & Maxwell's No. 3 Ida Hendrick, E half NE Sec. 29, Blk. B-5	Drlg. 400 ft.
Southern C. O. P. Co.'s No. 1 Ida Hendrick, T-88-G, SW SE Sec. 28, Blk. B-5	Location; moved material away
Southern C. O. P. Co.'s No. 1 Ida Hendrick, T-88-I, SE cor. E half NE Sec. 30, Blk. B-5	New location.
Southern C. O. P. Co.'s No. 1 E. G. Hutchings, T-90, NE cor. E half SE Sec. 47, Blk. 26	Location.

NORTH AND WEST TEXAS

(Continued from Page 56)

rison A flowed 260 bbls. from 2,412-24 feet. Simms' No. 1 Ribble was dry and abandoned at 4,257 feet.

NORTH CENTRAL TEXAS COMPLETIONS

Brown County

Amerada Petroleum Corp.'s No. 3 Gilbreath made 464 bbls. of oil and 500,000 feet of gas from sand at 1,321-39 feet. Bowers and others abandoned the location for their No. 1 Bradley. J. K. Hughes Developing Co.'s No. 3-A Gilbreath made 250 bbls. at 1,331-52 feet.

Humble Oil & Refining Co.'s No. 8 Gilbreath was good for 239 bbls. at 1,310-24 feet. No. 10 Gilbreath was an 85-bbl. completion after a 7-quart shot at 1,307-14 feet.

Mace's No. 1 Nation was dry and abandoned at 360 feet (corrected). Peck and others' No. 1 Mills was also a dry hole at 1,825 feet. Phillips Petroleum Co.'s No. 8 Newsome was shot with 12 quarts at 1,316-28 feet and made 150 bbls. afterward. Pitts and associates' No. 1 McGhee was plugged as a failure at 1,048 feet after picking up a hole full of water at 1,045 feet.

Selby Oil & Gas Co.'s No. 20 Ellis made 100 bb's. from sands at 1,337-39 feet and 1,347-61 feet. E. L. Smith Oil Co.'s No. 17 Smith was good for 50 bbls. after 5-quart shots at 1,330-34 and 1,350-58 feet. Total depth was 1,358 feet after plugging back from 1,370 feet. Veale and others' No. 1 Newton was abandoned as dry at 1,290 feet. Wheelock & Collins' No. 3 Smith made 160 bbls. at 1,329-41 feet, total depth 1,344 feet.

Bush & Spinney's No. 1 Richardson was completed at 1,435-38 feet. It made 25 bbls. initial but has since declined to 12 bbls. and is making 15 bbls. of water. Van Bibber & Lehman's No. 3 Evans was dry and abandoned at 705 feet.

Callahan County

Prairie Oil & Gas Co.'s No. 2 Webb made 24 bbls. after a 15-quart shot at 1,627-45 feet, total depth 1,651 feet. Same company's No. 3 Webb made 37 bbls. following a 30-quart shot at 1,625-40 feet, total depth 1,644 feet.

Coleman County

Jameson & Murray's No. 1 Havens was dry and plugged at 1,092 feet. Lee & Daniels' No. 1 Henderson was also a duster at 1,615 feet. Senior Petroleum Co.'s No. 1 Pfluger was another dry hole at 1,495 feet.

Comanche County

Moore's No. 1 Strickland was completed as a gasser good for 3,500,000 feet of gas at total depth of 2,825 feet. The hole was plugged back to 2,664 feet and shot with 60 quarts at 2,650-64 feet. Top of gas sand was 2,624 feet. Rock pressure is 985 pounds.

Eastland County

Adamson & Bearman's No. 3 Rosenquest made 100 bbls. after a shot of 50 quarts at 1,453-73 feet, total depth 1,476 feet. Atwood's No. 1 Gullet was dry and plugged back at 1,702 feet. Hooser's No. 5 Fox made 100 bbls. at 1,614-21 feet.

Magnolia Petroleum Co.'s No. 1 Pettit, which was completed in December of 1924 for 25 bbls. at 1,450-67 feet, is now drilling deeper at 1,700 feet.

Hoffman's No. 1 Poe was abandoned at 1,590 feet and the location for No. 2 was likewise abandoned.

McGee and others' No. 1 Lanquest was plugged back from 1,346 feet to 1,320 feet and shot with 20 quarts at 1,300-16 feet, after which it made 100,000 feet of gas.

Palo Pinto County

Cranfill & Reynolds' No. 1 Gilbert made 3,000,000 feet of gas at 3,821-29 feet. Upham Gas Co.'s No. 1 Wharton made 3,500,000 feet of gas at 4,038-40 feet.

Shackelford County

Simmons' No. 1 Ackers was dry and abandoned at 2,252 feet.

Stephens County

Adamson & Fouts' No. 1 Bradford, which was temporarily abandoned in August of 1926, is now drilling deeper at 3,700 feet. It had oil sand at 3,474-3,519 feet.

NORTH CENTRAL TEXAS AND WEST TEXAS
ESTIMATED DAILY PRODUCTION
Week ending November 26, 1927

Ranger district—	Production
Brown County	19,372
Callahan County	4,012
Coleman County	1,135
Comanche County	1,475
Palo Pinto County	458
Ranger	8,369
Shackelford County	5,003
Stephens County	8,844
Total, Ranger district	49,668
Increase	3
Wichita Falls district—	
Archer County	22,467
Baylor County	87
Clay County	543
Cooke County	5,103
Jack County	1,095
Montague County	8,955
Throckmorton County	1,255
Wichita County	27,736
Wilbarger County	10,601
Young County	12,457
Total, Wichita Falls district	91,293
Decrease	1,237
Total, North Central Texas	140,961
Decrease	1,234
West Texas district—	
Big Lake Field	22,318
Crane County	106,505
Crockett County	2,626
Ector County	12
Glasscock County	8, D.
Howard County	4,418
Jones County	1,342
Loving County	65
Mitchell County	3,432
Pecos County	43,083
Runnels County	95
Scurry County	45
Upton County	18,102
Winkler County	30,446
Total, West Texas district	232,489
Increase	15,571
Grand total, North and West Texas	373,450
Increase	14,337

OKLAHOMA REFINED PRICES UNCHANGED

(Continued from Page 44)

They also expect an increase in the foreign consumption resulting from the big increases being made in the sales of automobiles in these countries and no doubt the new Ford car will have its effect on the foreign consumption.

Stabilized Gasoline

Another factor is coming into the market, that of supplying superstabilized natural gasoline for motors without blending with refinery gasoline and during this past week one large natural gasoline manufacturer made his first shipment of this material to a European market. Because the quality of these natural gasoline products is so near that of the grade of gasoline being sold in Europe it will have a ready market from that standpoint.

Competitive Situation

The extension of markets is not only apparent in the case of natural gasoline but might be applied to other oils as well. Likewise this extension of the marketing territories is very apparent within the United States. There has always been some overlapping of trade territories by the refining centers in the various parts of the country but with quicker transportation by freight and cheaper transportation by tanker, most any area is anybody's market. More recently, Mid-Continent refiners have felt the keen competition being offered by the Gulf Coast refiners in the sale of lubricating oils. These Gulf Coast lubs have been offered throughout the Midwest at prices making the delivered cost below the Oklahoma delivered cost even though the latter take a lower freight rate in to this territory. Oklahoma refiners then stressed certain qualities in their oils not true of these Gulf Coast oils but the problem is now complicated with the introduction of lubricants made from crudes produced in the Mid-Continent and refined along the Atlantic Coast.

These are shipped back through the Gulf Coast into the Midwest. Since these are made from the same crudes used by the Mid-Continent refiners there is no difference in specifications and the practice of supplying them in this manner simply means that an additional volume of Mid-Continent lubs must find an outlet through the normal Group 3 territory.

Gasoline and Naphtha

The U. S. Motor grade was generally selling at 6 to 6⅛ cents, while last week the range was from 6 to 6¼ cents. The slow movement of this grade compared to the low endpoint grades accounts for this weakness and in some cases this was carried further, making the extremes of the price range from 5⅞ to 6⅛ cents. The volume of the 5⅞-cent material was not sufficient to represent the general market, but seemed to be discussed more than during any period over the month. There was no change in the prices on the other grades. Naphthas remained unchanged, but as weakness developed in the natural gasoline market they assumed a stronger position for use as a blending stock.

Kerosene and Distillates

News of an export inquiry for kerosene held prices firm at last week's figures but there was only a slow movement of the material from refineries. The 41-43 grade generally sold at 4½ to 4⅝ cents and only a few shipments were made at 4¾ cents, the high of last week's price range. These did not move in sufficient volume to establish the higher price as representative. Distillate shipments were greater but the mild weather, together with the fact that jobbers have been carrying a good volume of stocks, slowed the movement below what could be expected for this period of the year.

Natural Gasolines

Much of the natural gasoline production is in the BB and C grades because of the cooler weather and there has been such a large increase in this production the market has not been able to take care of all of it and manufactures were offering some of the C grade at 4⅞ cents. There was very little material moved to the Gulf for export and the general market was very heavy. The only material that showed strength was the A grade and was scarce at 5¾ cents.

Fuel Oils and Gas Oils

Added weakness developed in fuels over the week as a result of the lower prices being posted on Smackover crude and the

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NEED ANTIKNOCK AND VOLATILITY IN GASOLINE

(Continued from Page 275)

control detonation to a certain extent by the use of a mixture control. If there is any doubt as to the antiknock properties of the fuel, the mixture control should be left in the full rich position for all full throttle operations. While flying at part throttle it is usually perfectly safe to lean the mixture out even with a fuel of relatively poor quality.

As stated above, a great deal of research work is being done throughout the industry on the antiknock properties of fuels, and numerous new types of fuel are being placed on the market which are supposed to have properties superior to the ordinary product. Most of the manufacturers are perfectly sincere in setting up claims regarding the superior properties of their fuels but the aircraft operator is warned to be extremely careful in committing himself to the use of these new fuels. It may safely be stated that the majority of them are not suitable for use in aircraft engines having a higher compression ratio than 5 to 1.

Of the hundreds of new fuels recently put on the market, only two have been recognized as being satisfactory by the Army and Navy Air Services. These are gasoline blended with benzol or with tetraethyl lead and even these fuels must be used with caution, as it is not sufficient to insure a suitable antiknock value unless the other requirements as to purity and volatility are complied with. Commercial benzol is particularly apt to contain impurities which more or less destroy its antiknock value and in many cases these impurities are of a highly corrosive character which renders their introduction into the engine extremely dangerous. In cautioning the purchasers against many of the new fuels placed on the market, it is not intended in any way to reflect on the sincerity of the manufacturer of this fuel. The purchaser should, however, remember that rough and ready field tests are apt to be very misleading and that thorough laboratory facilities of the fuel manufacturer.

This fact is well illustrated by a recent experience of the Wright company. They were approached by one of the largest petroleum companies with the request to test a new fuel which they were marketing. These tests were undertaken with their positive assurance that the fuel had marked antidetonating properties and was in other respects suitable for use in aviation engines and there is no doubt but that the manufacturer was absolutely sincere in his claims. However, it required less than five mnutes full throttle operation of a Whirlwind engine to burn a hole completely through the head of one piston and seriously damage several other pistons. This result was, of course, a great surprise to the fuel manufacturer who had entirely failed to appreciate the wide difference between ordinary motor car operation and full throttle operation of a modern aviation engine.

The operator is also warned to be skeptical of claims that a given fuel will materially increase the power output of his engine. Providing the fuel is sufficiently volatile to give good distribution and has sufficient antiknock value to avoid detonation, very little improvement in engine operation can be secured by utilizing a much higher grade fuel. Tests conducted in the Wright factory indicate that without changing the design of the engine, little advantage can be gained from fuels of unusually excellent quality.

CARTER LED OKLAHOMA PRODUCERS WHILE GULF WAS FIRST IN TEXAS

By James McIntyre

The net production of the 45 leading crude oil producing companies in the Oklahoma Field in the first nine months of 1927 was 136,388,422 bbls., divided by quarters as follows: First quarter, 41,044,916 bbls.; second quarter, 45,097,026 bbls.; third quarter, 50,246,480 bbls., and the increase from one quarter to another is largely due to the increased production of the Seminole Field, which reached its peak in the middle of the third quarter.

The Carter Oil Co. led all with a net production of 15,657,329 bbls. in nine months. The Prairie Oil & Gas Co. was second with 10,090,550 bbls., the Magnolia Petroleum Co. third with 9,557,438 bbls., the Gypsy Oil Co. fourth with 8,759,349 bbls., and Sinclair Oil & Gas Co. fifth with 8,759,349 bbls.

The production figures are taken from the reports to the Oklahoma State Auditor for taxation purposes. Only 45 out of the 14,000 or more producers and royalty owners who filed reports are here given, the 45 having been those companies and firms that produced an average of 1,000 bbls. or more per day for the 273-day period.

Last year the Comar Oil Co. was among the very top-notch producers. For example, it had a production of 2,983,853 bbls. for the second quarter of the year, leading all operators. In the same quarter this year it had 1,388,501 bbls. and in the third quarter this had fallen to 1,100,903 bbls. It dropped to sixteenth place in the third quarter of this year. The Carter Oil Co., which topped all producing companies this year, was as low as seventh place last year. In the second quarter of this year the company had a net production of 6,584,558 bbls., while in the same quarter of last year it produced net 1,540,694 bbls. The big increase came from the company's Seminole leases.

The Indian Territory Illuminating Oil Co. had the most remarkable increase. In the third quarter of this year it produced 3,749,595 bbls. net. Since the middle of last year it advanced from less than 2,500 bbls. a day to nearly 41,000 bbls. a day, net, as an average for three months. This company opened the Seminole City Pool, the Bowlegs Pool and the Little River Pool, all in the Seminole Field, and its large acreage in that field yielded rich returns in oil, but at a great expense in drilling, producing and storage building.

The largest producer of crude oil in Texas in the first nine months of 1927 has been the Gulf Production Co., which far outclasses all competitors in this respect. The Gulf company produced 17,123,201 bbls. (gross) while its nearest competing company was the Yount Lee Oil Co., a Houston concern, with a total of 11,357,208 bbls. The Spindletop deep sand had much to do with the large production of these two companies, but the Gulf organization also drew heavily on the Crane-Upton area. Four companies produced over 8,000,000 bbls. each. The Texas Company, Phillips Petroleum Co., Magnolia Petroleum Co. and Humble Oil & Refining Co. The production of Texas companies is given here in gross barrels, while that of Oklahoma already mentioned was given in net barrels. Sixty Texas oil companies are listed as having averaged more than 1,000 bbls. a day for nine months.

There was little material difference between the total production of the leaders in the three quarters.

The Mid-Kansas Oil & Gas Co. and Transcontinental Oil Co., which jointly own most of the Yates Pool, had not yet begun to realize largely in oil from the Yates properties. They will figure among the leaders in future quarterly production reports when the Yates Pool is permitted to produce what it is capable of doing.

Noticeable among the large producers this year has been the Prairie Oil & Gas Co. with a total in the nine months of 4,578,451 bbls. This company, always prominent in the northern Mid-Continent fields, only recently entered the Texas area as a producer.

The Atlantic Oil Producing Co., a subsidiary of the Atlantic Refining Co., has also come to the front in Texas and is credited with 2,579,920 bbls. most of which came in the last of the three quarters.

GROSS PRODUCTION OF LEADING OIL COMPANIES IN TEXAS

	First quarter (bbls.)	Second quarter (bbls.)	Third quarter (bbls.)	Total 273 days (9 mos.) (bbls.)
Gulf Production Co.	5,333,582	6,195,776	5,593,843	17,123,201
Yount Lee Oil Co.	4,169,962	3,411,162	3,776,084	11,357,208
Phillips Petroleum Co.	3,189,861	2,962,760	2,660,000	8,812,621
The Texas Company	3,022,818	3,048,653	2,840,858	8,912,329
Magnolia Petroleum Co.	2,960,421	2,926,145	2,843,209	8,729,775
Humble Oil & Refining Co.	2,596,457	3,017,440	2,815,955	8,429,852
Big Lake Oil Co.	2,018,382	1,702,783	1,665,074	5,386,239
Prairie Oil & Gas Co.	1,629,326	1,510,666	1,438,459	4,578,451
Marland Oil Co.	1,608,526	1,386,779	974,180	3,969,485
Rio Bravo Oil Co.	1,579,034	833,039	773,953	3,186,026
Pure Oil Co.	984,464	925,217	956,060	2,865,741
Continental Oil Co.	925,276	873,648	750,056	2,548,980
Roxana Petroleum Corp.	698,873	765,374	902,342	2,366,589
Group 1 Oil Co.	727,405	649,222	564,371	1,940,998
McMan Oil & Gas Co.	578,537	470,549	336,831	1,385,917
Republic Production Co.	617,375	578,341	597,694	1,793,410
Simms Oil Co.	542,085	935,315	1,169,631	2,647,031
Amerada Petroleum Corp.	375,886	244,105	189,983	809,974
American Refining Co.	138,779	129,393	.....	268,172
Atlantic Oil Producing Co.	294,515	704,083	1,581,322	2,579,920
Bridwell & Heydrick	132,834	117,377	92,963	343,174
Barkley & Meadows	95,263	88,482	86,151	269,896
L. T. Burns	73,303	175,647	112,168	361,118
Cranfill & Reynolds	134,821	96,495	74,108	305,424
The California Co.	231,783	236,176	304,200	772,159
Church-Weekly-Fields	2,623	126,333	197,120	326,076
Crown Central Petroleum Co.	110,412	90,526	86,250	287,188
Dixie Oil Co.	267,201	293,464	255,360	816,025
Dixon Creek Oil Co.	461,127	451,000	440,729	1,352,856
Derby-Haines & Williams	209,887	133,273	70,623	413,783
Echo Oil Co.	166,334	133,435	53,417	353,186
Empire Gas & Fuel Co.	584,548	282,084	315,468	1,182,100
Eastland Oil Co.	124,378	649,284	1,120,599	1,894,261
Fain-McGaha Oil Corp.	157,262	198,773	165,267	521,302
Grayburg Oil Co.	253,778	231,218	212,091	697,087
Humphreys Corp.	109,244	114,887	100,744	324,875
J. K. Hughes Development Co.	329,720	568,242	276,588	1,174,550
Independent Oil & Gas Co.	174,289	220,272	223,509	618,070

PRODUCTION FOR 12 MONTHS HAS PASSED 900,000,000-BBL. MARK

The United States has passed the 900,000,000-bbl. mark in production for 12 months. In the year ending November 30, approximately 902,425,000 bbls. of crude oil was produced in this country.

For the 12 months ending October 31 the country produced 899,276,256 bbls. divided by months as follows:

Production in 12 Months

1926:	
November	70,649,706
December	73,823,829
1927:	
January	73,530,382
February	68,321,542
March	75,923,905
April	74,482,365
May	77,646,346
June	75,018,179
July	78,597,538
August	78,283,250
September	75,604,849
October	77,349,365
Total	899,276,256

The production for the 12 months ending October 31, 1926, was 756,112,175 bbls. The increase in the 12 months ending October 31 this year was 143,164,081 bbls. over the same period last year, an average increase of 392,230 bbls. per day.

It is safe to estimate that the production for the calendar year 1927 will be no less than 902,500,000 bbls. In using that figure every provision is made for a possible pronounced drop in production of the Seminole Field in December. The total for the year may be considerably higher than that given, as Seminole has been maintaining an unlooked-for strength thus far, and the expected big drop has failed to show material signs.

July was the peak month this year. In that month the country produced 78,597,538 bbls., an average of 2,535,401 bbls. per day. The peak day was July 30, when the country produced approximately 2,600,000 bbls. It was on that day the Seminole Field reached its peak of 527,400 bbls.

F. E. Kistler & Co.	211,586	122,587	96,011	430,184
Midwest Exploration Co.	366,835	343,768	282,215	992,818
McCarty Oil Co.	63,744	139,723	162,543	366,010
Mid-Kansas Oil & Gas Co.	195,955	433,223	365,677	994,855
Milham Corp.	135,225	136,066	124,461	395,752
J. C. Maxwell	19,382	137,569	182,733	339,684
Navarro Oil Co.	97,507	161,082	159,743	418,332
Pantex Oil Co.	124,909	80,750	69,999	275,658
Panhandle Refining Co.	86,267	102,732	469,748	658,747
Petroleum Producers Co.	142,891	178,184	146,394	467,469
Ryeade Oil Corp.	123,560	197,173	201,226	521,959
Roeser & Pendleton, Inc.	538,386	298,769	113,977	951,132
E. C. Stovall	94,990	182,705	25,927	303,622
Sun Oil Co.	346,607	609,760	946,941	1,903,308
Skelly Oil Co.	370,825	344,982	310,132	1,025,939
Sinclair Oil & Gas Co.	502,178	371,000	337,926	1,211,104
Texas Pacific Coal & Oil Co.	241,261	468,631	573,890	1,283,782
Tidal Oil Co.	196,288	373,516	493,587	1,063,391
Transcontinental Oil Co.	236,627	130,068	92,911	459,606
H. F. Wilcox Oil & Gas Co.	198,329	205,012	165,793	569,134
L. H. Wentz	41,890	115,350	93,936	251,176
White Eagle Oil & Refining Co.	172,596	156,409	120,557	449,562
Total	42,118,672	42,766,477	42,153,587	127,038,736

NET PRODUCTION OF LEADING PRODUCING ORGANIZATIONS IN OKLAHOMA IN FIRST NINE MONTHS OF 1927

	First quarter (bbls.)	Second quarter (bbls.)	Third quarter (bbls.)	Total 273 days (9 mos.) (bbls.)
Carter Oil Co.	4,140,542	6,584,558	4,932,229	15,657,329
Magnolia Petroleum Co.	2,405,809	3,393,555	3,758,074	9,557,438
Prairie Oil & Gas Co.	2,849,727	2,976,605	4,264,218	10,090,550
Gypsy Oil Co.	3,076,784	2,931,207	2,751,358	8,759,349
Amerada Petroleum Corp.	2,182,057	2,711,934	2,286,876	7,180,867
Sinclair Oil & Gas Co.	3,402,519	2,560,816	2,712,226	8,675,561
Indian Territory Illuminating Oil Co.	1,284,780	2,147,923	3,749,595	7,182,298
Pure Oil Co.	2,059,254	2,111,045	2,843,753	7,014,052
Mid-Continent Petroleum Corp.	1,849,705	1,934,208	2,147,874	5,931,787
Comar Oil Co.	1,834,389	1,388,501	1,100,903	4,323,793
Barnsdall Oil Co.	1,445,521	1,351,310	2,440,753	5,237,584
Phillips Petroleum Co.	1,248,106	1,207,017	1,088,716	3,545,839
The Texas Company	976,173	1,104,561	2,175,211	4,255,945
Tidal Osage Oil Co.	1,503,486	1,052,322	670,289	3,226,097
Roxana Petroleum Corp.	884,444	1,023,841	1,629,111	3,537,396
T. B. Slick	777,138	381,592	285,500	1,444,230
Marland Oil Co.	678,791	942,650	917,122	2,538,563
T. B. Slick, Inc.	637,404	573,937	687,045	1,898,386
Empire Gas & Fuel Co.	303,537	856,932	1,007,509	2,167,978
Skelly Oil Co.	526,261	577,165	974,835	2,078,261
Turman Oil Co.	194,895	541,204	170,606	906,705
Independent Oil & Gas Co.	679,878	541,000	1,043,962	2,264,840
Kewanee Oil & Gas Co.	746,264	531,010	365,332	1,642,606
Atlantic Oil Producing Co.	432,579	490,031	757,143	1,679,753
Shaffer Oil & Refining Co.	348,864	421,000	428,390	1,198,254
Humble Oil & Refining Co.	437,466	417,169	327,635	1,182,270
Dixie Oil Co.	415,000	411,000	351,612	1,177,612
Twin State Oil Co.	238,572	371,988	837,703	1,448,263
Superior Oil Corp.	430,096	371,139	122,108	923,943
Tidal Oil Co.	401,146	345,358	683,205	1,429,709
Wentz Oil Corp.	367,107	328,521	254,233	949,861
Mid-Kansas Oil & Gas Co.	203,197	288,110	231,496	722,803
H. F. Wilcox Oil & Gas Co.	158,361	283,668	406,624	848,653
Wolverine Oil Corp.	216,056	213,956	209,479	639,491
Josey Oil Co.	302,371	198,193	183,111	683,675
Kingwood Oil Co.	87,545	197,340	177,832	462,717
Westland Oil Corp.	213,055	191,804	37,545	442,404
Transcontinental Oil Co.	250,771	188,993	124,565	564,329
Gilmer Oil Co.	37,814	168,000	136,194	342,008
Champlin Refining Co.	95,207	166,000	168,136	429,343
Foster Petroleum Corp.	256,970	160,689	127,776	545,435
Westheimer & Daube	146,249	124,245	98,665	369,159
Minnehoma Oil Co.	80,308	111,784	333,765	525,857
Devonian Oil Co.	120,904	111,145	103,409	335,458
Philmack Oil Co.	117,814	110,000	142,157	369,971
Total	41,044,916	45,097,026	50,246,480	136,388,422

E. T. PATTERSON DIES SUDDENLY AT HIS HOME

INDEPENDENCE, Kans., Nov. 27.—Erastus T. Patterson, treasurer of the Prairie Oil & Gas Co., and for 43 years connected with one or another of the Standard group of companies, died suddenly at his home today. He had been in failing health for some time.

Mr. Patterson was born in Kenosha,

E. T. Patterson

Wis., on September 30, 1865. He began his business career at the age of 19 years with the Oil Cities Fuel Supply Co. at Titusville, Pa. He was advanced rapidly from one position to another and then transferred to a position of trust with the Mahoning Fuel Co. at Youngstown, Ohio. Thus far he had been in the gas business altogether. In the early days of the development of the Kansas oil fields his superiors placed him with the Kansas division of the Forest Oil Co. and he was cashier and assistant secretary of that division when the Prairie Oil & Gas Co. was organized and took it over. In 1910 he was made treasurer of the Prairie company.

Mr. Patterson is survived by his wife; two daughters, Mrs. E. G. Schreck of Eldorado, Kans., and Mrs. Gerald Todd of Independence and four sisters, Mrs. Charles Church of Titusville, Pa.; Mrs. John Fertig and Mrs. F. C. Fertig of Pasadena, Calif., and Mrs. Gilbert Bloss of London, England.

OIL FIELD PROBLEM SOLVED BY TENTS

(Continued from Page 50)

is delivered to tent dwellers who want it—and many do. An automobile of one of the better grades parked beside an oil field tent is a common sight.

Not infrequently a girl emerging from one of these tents is made up as to clothes and to toilet niceties in such a manner that when she mingles with the other girls in the street or in the motion picture house there is no way in which to distinguish her from most of her sisters who have the advantage of vanity dressers and the newest things in toilet accessories. How she does it must remain an insoluble enigma, to the masculine mind anyway.

Children from these oil field tent homes go to school like other children. If no school building is near by it is a common practice for the oil companies to construct one. Sometimes the oil companies provide a teacher too, but ordinarily the teacher is provided by the county. In any event, it rarely occurs that with all the excitement and the departure from normal modes of living that necessarily attend the overnight growth of a boom oil town, the education of the child is overlooked. The tent homes contribute pupils not only for the grade schools, but for high schools too, and not improbably for college. Some of the adults attend church services. Many of the children go to Sunday school.

Health conditions among tent dwellers depend, as they do elsewhere, upon the intelligence and the care applied to sanitation and the usual precautions against disease. The outside toilet, without the safeguards that always should attend its use, is blamed for an outbreak of typhoid in the Seminole Field that threatened to become extremely serious in the summer and fall of 1927. Most of the tents have no provision for the exclusion of flies, and these insects, with their germ-carrying propensities, were in a fair way to start a pestilential epidemic when the advent of freezing weather, along with the measures adopted by overworked doctors of the district, checked the trouble.

Not Necessarily Unhealthful

In themselves the rather free-and-easy conditions of oil-field tent life, with their outdoor flavor, are not conducive to ill health.

"The trouble lies in failure to employ ordinary germicidal measures, in uncleanliness and in appalling ignorance of how to care for young children, rather than in any necessary conditions accompanying life in these oil field tents," said T. G. Billington, of Seminole City. "Once I was called out in a maternity case and I found the expectant mother in a bed soaking wet from a recent rain. We rarely find any facilities for sterilizing gloves and instruments except by boiling water as best we can on a stove that often is outside the tent. Folk who would live filthily in ordinary homes live even more filthily in these tents. The inevitable result is disease. A strange thing is that nothwithstanding the utter lack of sanitary precautions in many of these tents, I do not know of one instance in which death from infection has attended a maternity case in the Seminole Field."

A remarkable fact in connection with oil field tent life is that the tents withstand some of the most violent windstorms. Occasionally, of course, a tent is wrecked by high wind and the occupants are obliged to rush to the nearest shelter available. The standard tent used is ready for erection when it is received by the purchaser. It needs merely to be unwrapped and to be set with the accompanying poles and guy-ropes, the latter fastened to stakes driven into the ground.

Fire, perhaps, is the worst hazard, for if flames once start in one of these tents they do their work quickly. There have been fatal fires of this kind in the Seminole Field. W. L. Plumb, a hotel proprietor in Seminole City, told of one of these which occurred about a year ago, when the roads in the field were at their worst.

"I was driving from Wewoka to Seminole City about 7:30 o'clock in the evening," said Mr. Plumb, "when I encountered one of those traffic jams that were common then. It was caused by a mudhole in the road a mile south of Seminole City. Some 15 or 20 automobiles were waiting their turn to be pulled through the quagmire by one of the three teams of horses that were being kept busy at this job, each motorist paying for the service, of course. A man drove up in an automobile and explained that he had in his car a man, a woman and their little child, all terriby burned in a fire that had destroyed their tent 2½ miles southwest of Seminole City. He was trying to get the three victims to Seminole City for medical treatment and he asked the privilege of having his car pulled through the mud ahead of the waiting line. Although it was an impatient lot of motorists waiting there, every man of course promptly consented to letting that car have precedence. The mother died later from her burns. I believe the father and child recovered."

Among the tent dwellers in the Seminole Field are some—it would be impossible to say how many—who have come from homes of culture and refinement. Some have adopted the life in a sprit of adventure. Some are educated men who have failed to make their way in the business world and are trying their luck with others in the boiling life of a new oil field. Mose of them are oil workers devoid of sentiment who have accepted this sort of home out of necessity or because it was cheap and "filled the bill."

It must not be supposed that all oil workers, even in the boom towns that spring up magically where new pools are found, live in tents, for the major oil companies build substantial frame houses for the more permanent employes. These houses are equipped with modern conveniences, including electric light, gas, water-heater, etc. The investment in such homes for employes on the part of some of the large oil companies is said to approach a quarter of a million dollars.

DEATH OF I. C. WHITE, ANTICLINAL PIONEER

MORGANTOWN, W. Va., Nov. 25.—Dr. Israel C. White, of Morgantown, state geologist for West Virginia since 1897, who was internationally known in his profession, died in the Johns Hopkins

Dr. Israel C. White

Hospital, Baltimore, Md., at midnight last night. His age was 79. Death followed a minor operation, which Doctor White underwent on Tuesday.

As a geologist he specialized in coal, petroleum and natural gas deposits and took pride in the development of Pennsylvania and West Virginia oil and gas fields, which were located by his "anticlinal theory," which was advanced in 1882, and demonstrated in 1885.

Doctor White's "anticlinal" theory is, in brief, that water, oil and gas preserve their respective levels in the porous rocks of the earth as they do in the open air. That is, water, being the heaviest, will stay in the depression or synclines of a geological formation, while oil and gas will seek the higher levels of the elevation or anticlines. Thus the prospector may expect to find water in the valleys, oil on the slopes, and gas on the summits of the hills.

Doctor White was assistant geologist of the second geological survey of Pennsylvania from 1875 to 1884 and of the United States Geological Survey from 1884 to 1888. He was professor of geology at West Virginia University from 1877 to 1892, and he became state geologist of West Virginia in 1897, serving without salary.

At the request of the Brazilian government Doctor White went to Brazil in 1904, and for two years was chief of the coal commission of that country.

Doctor white was treasurer of the Geological Society of America from 1892 to 1907, and president in 1920. He had also been president of the American Association of Petroleum Geologists and had twice been a delegate to European congresses. At the White House Conference of Governors in May, 1908, his address on "The Waste of Our Fuel Resources" did much to advance the conservation movement.

A few years ago he presented to his alma mater, West Virginia University, and the city of Morgantown, 1,900 acres of coal land in Marion County, West Virginia, which was estimated worth $3,000,000, the revenue to be divided equally between the city and the university.

OKLAHOMA REFINED PRICES UNCHANGED

(Continued from Page 284)

desire of refiners to decrease stocks. But despite these factors no material was moved below 70 cents. The railroads have been slow in working up contracts for next year's supply but refiners are not anxious to formulate contracts based on present fuel prices and feel that if they can delay the new contracts, there is a chance that conditions will improve and they will be able to secure a better base price.

They do not feel that last year's contracts will be acceptable to the railroads, especially those in which a minimum of 90 cents to $1 were specified. The present low fuel prices are fundamentally due to the excess production of crude oil and as the West Texas fields are developed there is a promise of a continued oversupply of fuel oil for many months to come. But should the price of fuel oil fall much lower or the price of gasoline increase materially, there will be a tendency to use this excess material as a cracking stock.

To further aggravate the present situation, it is apparent that many of the larger users have built up large stocks throughout the summer at what they considered low prices and are now using from their storage. For the present at least there seems to be no justification for the fuel market to strengthen materially. Gas oils have acted in sympathy with fuels and some refiners who stored gas oil as cracking stock are now willing to sell a portion of these stocks, but there is no ready market adequate to absorb the material available. Most of the material is being held by the larger refiners and for that reason the price has been fairly stable and no material is being offered below 2¼ cents and that is available only in small lots.

There were no changes in prices on either lubricating oils or wax but their movement was slow, and the future of the market over the next few weeks is none too optimistic. Cylinder stocks were a little weaker and bright stock remained very heavy at last week's prices.

STRENGTH APPARENT IN SHREVEPORT AREA

SHREVEPORT, La., Nov. 28.—A showing of greater strength all the way down the line from gasoline to fuel oil characterized the refined oil market in this territory during the week, fuel oil taking the lead with an advance to $1 per barrel, rock bottom price, whereas it had been obtainable at 90 cents to $1. One refiner reports movements of small lots at $1.05. Kerosenes continued somewhat weak though without any change in price from the 5¼ cents prevailing for the past two weeks. Gas oil remained firm at 3 to 3¼ cents.

Rumors of a buyer of kerosene for export being in the market for 500,000 gallons were not confirmed so far as booking any such contract goes but neither has the inquiry definitely been withdrawn. The one refiner in position to handle the contract is not disposed to shade price on any of his products.

Other companies report satisfactory orders and in one instance it was reported that runs to stills during December may be increased to take care of bookings for deliveries during the month. On the whole, the market here has stiffened and refiners are feeling somewhat better than they have been for the past few weeks.

MOVING TO MIDLAND

HOUSTON, Tex., Nov. 26.—The Salt Dome Oil Corp., of Houston, Tex., has announced it will close its Houstoh offices after January 1, and will make its headquarters at Midland, Tex. The move is being made because the company will have its chief interests in the West Texas fields.

PECOS VALLEY POWER AND LIGHT COMPANY

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24,000 HORSE POWER

LOCATED IN THE HEART OF THE WEST TEXAS OIL FIELDS

April 25th, ground was broken for the construction of the Company's $2,500,000 system.

July 15th, the lines were hot at every pool in the Crane, Upton and Reagan County Oil Fields.

Our lines have since been extended to Pecos County and will reach each new pool within the district in time to take care of early operations.

The resources and energy required to carry out this stupendous program will be devoted to the exclusive service of the producers in the West Texas Oil Fields.

Exclusive Oil Field Power

Pecos Valley Power & Light Company

Fort Worth National Bank Building
Fort Worth, Texas

Technical Questions Answered

BY CHARLES K. FRANCIS, PH.D., TECHNICAL EDITOR

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to Dr. C. K. Francis, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible so as to assure a satisfactory answer.

All inquiries should be signed and if other than the given initials are to be used please indicate the desired letters.

Questions involving patented processes, intricate formulas and calculations and estimates of costs, for obvious reasons, cannot be answered. The replies will appear on this page within a reasonable time.

GASOLINE HAVING ANTIKNOCK QUALITIES

Are there many real antiknock gasolines being sold today, that is, gasolines which can be tested and shown to have considerable antiknock qualities and not only some strange color? Is the antiknock quality developed in refining or does some substance have to be added to the gasoline?—E. C. Y.

There are numerous gasolines on the market at this time which have real merit as nondetonating fuels and there are others which have been examined in knock-testing laboratories and found to have little if any value from the status of pronounced antiknock properties.

There has been a decided trend toward higher compression engines. A few years ago the compression ratio was close to 4.5 but it has now risen to 5, and even higher in a few motors. It is possible with the nondetonating fuels and high compression ratio to obtain increase of mileage and better performance. There is considerable interest being shown in this property of gasoline and many refiners are investigating the problems which are involved in the manufacture of a high-grade, nondetonating motor fuel. While some automotive experts are of the opinion that even higher compression ratios will be used, others suggest that much will have to be done toward perfecting our gasolines.

Many crude oils contain substances which reduce the tendency of the gasoline to knock. The refining process reduces many of these and it is one of the problems now before the refiners to change and modify the processing of the crude oil so that the valuable antiknock constituents, such as the unsaturated hydrocarbons, naphthenes and aromatics, will be retained. The cracking operation, when applied to the products from some crudes, causes the formation of such compounds and this fact explains why some cracked gasolines are considered to be better motor fuels than straightrun gasolines from the same kind of crude.

There are a number of different chemical compounds which have antiknock value but the cost of these is usually so much higher than that of gasoline that the tendency appears to be away from their use and toward proper treatment of the oil and distillates during the process of making the gasoline.

DANGEROUS AND TOXIC QUANTITIES OF HYDROGEN SULPHIDE

What are the dangerous amounts of hydrogen sulphide present in the air, that is, the amount which would be unsafe to breathe under working conditions? What are the first symptoms noticed? C. R. S.

Hydrogen sulphide poisoning appears to take place in two stages; these have been defined as acute and subacute. The subacute cases result from brief exposure and where the concentration is not high. The acute condition results in asphyxiation when the person has been exposed for some time and usually to a high concentration of the gas.

When the quantity of hydrogen sulphide is low, 0.005 to 0.02 per cent by volume, and the exposure is brief, a smarting of the eyes, headache and nausea may occur; longer exposure usually causes irritation of the eyes and nose, throat and lungs, which often incapacitates the victim and may result in illness and even death. Exposures to high concentrations, above 0.05 per cent, asphyxiation almost invariably results followed by death. The bad odor of hydrogen is distinctive and men should not work without protection when the odor is strong.

Much of our knowledge about the toxic properties of hydrogen sulphide is based on Bureau of Mines investigations as reported in Bulletin 231, Investigations of Toxic Gases from Mexican and Other High-Sulphur Petroleums and Products. The following is from page 73 of this bulletin:

Susceptibility of Animals to Hydrogen Sulphide

Subject—	Pct. for Subacute Symptoms	Pct. for Acute Symptoms
Canaries	0.005 to 0.020	0.02 or more
White rats	.005 to .055	.05 or more
Dogs	.005 to .065	.05 or more
Guinea pigs	.005 to .075	.075 or more
Goats	.005 to .090	.090 or more

It is thought that men react in a manner similar to that demonstrated with the animals. The concentration of 0.01 per cent was distinctly irritating to men who were exposed to this concentration. Certainly men should not be exposed to anything more than a trace, or about 0.005 per cent, and prolonged exposure to this quantity may prove fatal.

OILINESS AND VISCOSITY

What is the difference between the oiliness and viscosity of lubricating oils? An explanation of these terms would be appreciated.—A. N. B.

Viscosity is a property of liquids which has to do with resistance to a change of shape. It is indicated in an oil by its resistance to flow and is inversely proportional to fluidity. Oils flowing with difficulty, such as the thick heavy oils, have high viscosity and are classified as viscous oils. Those which flow rapidly under normal conditions are without body, that is they are thin liquids, are low in viscosity and often known under the term nonviscous.

The true or absolute viscosity may be measured by the quantity which passes through a capillary in a determined time and is expressed in terms of centimeter, gram, second. This method requires too much care and time for practical purposes, consequently a simpler procedure has been widely adopted. This is really not a determination of viscosity but the rate of flow under definite conditions in an instrument known as a viscometer. The nonviscous oils passing through the viscometer much quicker than the viscous oils.

When two metallic surfaces are brought together, without lubrication, there is resistance to movement set up by the particles of the metals at the surface; in the presence of a lubricating oil the bearing surface is no longer metal, but an adhering or adsorbed film of oil. The degree of friction will depend upon the stability of this film and oiliness has to be considered the controlling factor in the matter of this stability. Wilson and Barnard, in the Journal of the Society of Automotive Engineers, Volume 11, page 143, 1922, define oiliness as that property of lubricants by virtue of which one fluid gives lower coefficients of friction than another fluid of the same viscosity, generally at low speeds or high loads.

The Role of Oiliness in Industrial Lubrication was discussed by W. C. Wilharm in Industrial and Engineering Chemistry, Volume 18, page 463, 1926, and the following is quoted from his article:

"It is well known that various lubricants differ in the property of oiliness although the viscosities are about the same. Fatty oils and acids invariably give lower values of static friction than mineral oils when two surfaces are rubbed together under conditions of ruptured film lubrication. There is fairly general agreement on the following points regarding oiliness: A property of lubricants, other than viscosity, generally known as oiliness, is of considerable importance in economic lubrication. It is a function of the chemical constitution of the lubricant. It is generally attributed to an absorbed film on the surface.

The apparatus for measuring the property of oiliness consists of an inclined plane. The static friction is taken from the angle of inclination when a slider just moves upon a specially prepared surface. Provision is made for temperature and pressure control. The actual surfaces used for the measurement consist of a plate 3 by 5 by one-fourth inches made of one of the metals used for bearings or journals and a slider consisting of three 1-inch balls, also made of one of the generally used metals, held rigidly on a frame so no rotation can take place. The initial motion of the slider is detected by means of a micrometer screw in series with a small voltage and an indicating device such as a voltmeter so that the circuit is closed when the slider moves less than 0.001 of an inch. After the slider has been placed in position for a determination the micrometer is screwed up to the slider from the direction in which slips occurs and then backed off just far enough to break the contact. The slightest movement of the slider remakes the contact, which can readily be observed with the indicating device."

OIL SHALE RECOGNIZED AND CLASSIFIED

What is the difference between oil shale and other rocks? How can this kind of shale be recognized and classified as to oil it contains?—W. C. L.

You will find much information about oil shale in United States Department of Commerce Bulletin 249, Manual of Testing Methods for Oil Shale and Shale Oil, by Lewis C. Karrick. The direct answer to your question is quoted from this bulletin.

"The term oil shale covers a wide variety of solidified mixtures of argillaceous sediments and organic matter. The muds from which the shales were formed came from the erosion of many kinds of rocks within great drainage areas. The eroded materials were transported by streams to their final points of deposition—probably fresh water lakes. The organic matter in the shale is generally accepted to be plant remains derived either from accumulations of vegetation carried by the streams into the lakes or from algae that grew in the lakes. The oil-shale measures contain many beds of oil shale, and the yield of oil ranges from a negligibly small quantity in some beds to as high as 80 gallons per ton of shale in others. The organic substance of true oil shales is only slightly soluble in the common solvents of bitumen. Oil, therefore, is not present as oil in the shale, but must be formed from the organic substances of the shale by the application of heat, that is, by destructive distillation."

A rough test may be made by heating the shale in a test tube. Drops of oil will collect on the cooler part of the tube if the specimen is oil shale.

NATURAL GASOLINE CONSUMED AS MOTOR FUEL

How much natural gasoline is used as motor fuel or blended with refinery gasoline for this purpose?—L. S. D.

We have no information showing the quantity of natural gasoline which was used in the raw state for motor fuel. The following is from the United States Bureau of Mines report for the month of August, which indicates the quantity of natural gasoline which was consumed in blending for motor fuel.

District—	Gallons
Appalachian	196,000
Indiana, Illinois, etc.	25,000
Oklahoma and Kansas	2,014,000
Texas	627,000
Louisiana and Arkansas	237,000
Rocky Mountain	86,000
Total, excluding California	3,185,000

The total production of natural gasoline during August was 135,000,000 gallons, a daily average of 4,350,000 gallons. The total motor fuel produced for the same period was 1,189,400,000 gallons, of this quantity 9,000,000 gallons was benzol. The total motor fuel produced cannot be separated into refinery gasoline and natural gasoline because many refiners include natural gasoline in the statement of gasoline manufactured.

SOLUTION OF GAS IN OIL

How much gas is it possible to dissolve in crude oil? Under ordinary conditions is the gas just held in the oil in solution or does it come out because of some substance being broken up?—N. H. A.

The kind of oil and the nature of the gas have much to do with the degree to which a gas will dissolve in an oil. The lighter oils being capable of dissolving more of a given gas than the heavy oils. A light oil may hold in solution as much as five times its own volume of methane. Hydrogen sulphide has been dissolved in oil to the extent of 100 per cent.

As a general rule the higher the molecular weight of the hydrocarbon gas, the lower the solubility in the petroleum. The hydrocarbon gas, for example, methane, is held in solution; but other gases may be formed as decomposition products when the crude oil is heated.

Kerosene, and oils containing large quantities of kerosene, have high solvent action for some gases. Carbon dioxide being more soluble in kerosene than in water. Sulphur dioxide is very soluble, some oils absorbing over 20 per cent of the gas. Hydrogen, nitrogen and oxygen are soluble in oil to only a slight extent; however, somewhat more so than in water. Ammonia is so'uble to nearly 50 per cent.

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EFFECT OF PINCHING ON GAS-OIL RATIOS

(Continued from Page 256)

tive of all field conditions. The position of each test well is shown on Plate 1.

Summary and Conclusions

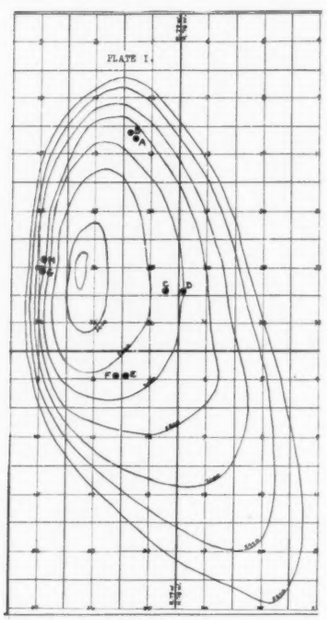
Briefly, the experimental work in the Salt Creek Field showed the following facts:

1. Most flowing wells, with some exceptions, tend toward inefficiency, or a gradual increase in gas-oil ratio, even under methods of producing which started with relatively small ratios of gas per barrel. Well conditions continually change, necessitating changes in control.

2. The use of "back pressure", "control", or "pinching" was limited in these tests in the Salt Creek Field to securing gas-oil ratios below the open-flow casing basis, and should not be used at random in any field without studying the individual well.

3. Every well is a problem in itself, and the same method of reducing the amount of gas per barrel in one well will not necessarily apply to another well.

4. There are three classes of wells: those which yield reduced gas-oil ratios under control; those which do not; and those belonging to a middle class which



Structure contour map of Salt Creek oil field based on second Wall Creek sand showing test wells. Contours approximate.

have characteristics of both of the other types.

5. Wells of the first class will probably give results under any type of control. Wells of the second class will probably not respond at all, while those under the third classification may occasionally give a reduction in ratios; but detailed experiments would have to be performed to determine what type of control would be satisfactory.

6. Reducing gas-oil ratios usually means reduction in daily oil production.

7. Wells in the Salt Creek Field of the type which would respond to control had several typical characteristics which were identified. Wells which would not respond also had rather definite characteristics.

8. Inefficient wells should be closed in entirely, if consistent with field conditions and policies.

9. The question of efficiency is probably related directly to the amounts of gas and oil, their respective velocities, and the expansion of gas. If methods of producing cause the ratio between velocities of gas and oil to increase beyond a critical point, it is believed inefficiency will result. This point probably varies in each well. Additional experimenting will be done in connection with this problem.

10. Operators should experiment with flowing wells in an effort to reduce their gas-oil ratio to a minimum. Even in the most efficient well performance in the Salt Creek Field, there was enough gas wasted for every barrel brought to the surface to lift another barrel of oil.

11. Casing flow and its control by gate valves usually gave inefficient results in gas-oil ratios, with a few exceptions.

12. Casing flow of a certain percentage of the total open flow was easier of control by flow nipples of "beans" and gave somewhat better gas-oil ratios than did gate-valve control.

13. Producing a well through tubing was generally the best arrangement, thereby obtaining increase of efficiency; although there were exceptions. In those exceptions, however, it is believed some tubing arrangement would have given the desired results.

14. There seems to be a critical point based on percentage flow above and below which a well will respond in some manner with a reduction of gas-oil ratios.

15. Although there seems to be no consistent relation between pressure and gas-oil ratios, in general, methods of producing which give small flowing pressures are the most efficient.

16. The work described in this paper indicated that pressures plotted against per cent flow gave straight line curves for inefficient wells, and curves resembling hyperbolas for efficient ones.

Explanation of Terms Used

In order that the report may be more easily read and understood a brief definition is given.

Gas-oil ratio, gas per barrel, or gas factor. These terms are analagous and refer to the direct method of comparing efficiency of production from different tests in terms of the amount of gas produced with each barrel of oil.

Efficiency. In this report the term "efficiency" has been considered as a relative efficiency depending upon the gas-oil ratio. A reduction of gas-oil ratio below the ratio given by wide-open casing flow was considered an efficient performance; and the lower the gas-oil ratio, the higher was the efficiency. This differs from the ordinary engineering acceptance of the definition, where the efficiency of well performance is rated in per cent.

It might be possible through the use of a certain producing method to lower the gas-oil ratio below the result given by some other method, but unless the reduction is below the figure given by the normal method of equipping the well (usually flowing it through casing) there is no justification for the expenditure of time and money to change the equipment.

Open-flow Capacity. Production of either oil or gas when well flows wide open through casing.

Casinghead Pressure. This term is used for the "flow pressure" when the well is flowing through casing and it was measured at the top of the casing on the control head.

Tubing Pressure. The "flow pressure" measured at the top of tubing when the well was produced through tubing. All pressure readings were taken by means of recording pressure gauges.

Pressure Control. The control of well pressures by methods of producing, in order to produce a maximum amount of oil with a minimum amount of gas.

Back Pressure. The pressure imposed against the sand by pressure control on the well.

Closed-In Pressure. The maximum pressure indicated at the top of the well after it has been closed in long enough to allow equilibrium to take place.

Rock Pressure. The actual pressure in the productive oil sand, which is equivalent to a combination of the "closed-in" pressure and the static pressure at the bottom of the well created by the column of fluid in the well.

One hundred per cent flow has been used to designate the results of Test 1 in this report and all estimated open-flow capacities based on the production decline of gas and oil. All percentages in the succeeding tests are calculated upon the assumption that the open-flow capacities are 100 per cent.

Oil Per Day. Total number of barrels of oil per 24 hours.

Gas Per Day. Total number of cubic feet of gas per day, calculated on a basis of 15.025 pounds absolute and 60 degrees Fahrenheit temperature.

Per Cent Oil. Daily oil production calculated to a percentage of the potential open-flow capacity estimated for every test.

Per Cent Gas per Barrel or Per Cent Gas-Oil Ratio. The average gas-oil ratio of a test expressed as a percentage of the gas-oil ratio established for each test by the estimated open-flow gas and oil production.

Pinching. Restricting the flow of a well by means of gate valves or flow nipples. Exact "pinching", to a definite figure such as 75 or 50 per cent of the full open-flow capacity of a well, was not altogether practical, because the gate valve was not capable of sufficiently fine adjustment. Adjustment to a designated "pinch" was made as close as conditions would permit.

Stopcocking. Controlling gas pressures and flow of oil in oil wells by keeping the well closed in and the gas confined, except during stated intervals when the oil is flowed.

Gas Gravity. Specific gravity of the gas based on air as 1.0.

Gallons per 1,000 cubic feet of gas or gallons per 1,000. Gasoline content or richness of the gas expressed as gallons of gasoline contained in 1,000 cubic feet of gas.

Methods of Taking Measurements

Data for comparison were obtained on:

1. Daily gauges of oil production.
2. Daily gauges of gas production.
3. Gasoline content of the gas.
4. Gas gravities.
5. Daily atmospheric temperatures.
6. Flow pressures.

The methods used are as follows:

Gauging of Oil. Gauging of oil was done for two purposes: first, to adjust the percentage flow of the wells in accordance with the prescribed tests; and, second, to determine the amount of oil produced throughout the tests. The oil from each well was kept separate by flowing it through a 3-inch line into a individual "Bross" gas trap and thence to a tall "gun barrel" tank of either 250 or 500 bbls. capacity. From the "gun barrel" the oil flowed by gravity to a near-by field storage tank.

Measurement of Gas. All gas measurements throughout the testing were made by means of orifice meters placed at each well's tank battery. The charts were changed and calculations made so that the daily progress of each test could be known as soon as possible. Care was taken to have the proper size orifice plate in the gas line leading from the trap to prevent any unmetered gas from escaping into the flow tank and then into the air.

When weather conditions prevented the taking of daily gauges, the oil and gas volumes for the individual days were computed from the totals of those periods.

Determination of Gasoline Content. The richness of the gas from each well was determined every day by a small charcoal absorption test meter, except in a few instances. This method of testing natural gas for its gasoline content gives high results as compared with the commercial extraction in the Salt Creek Field. About January, 1923, the Midwest Refining Co. changed to a condensible basis of testing, which gave about one-half as much gasoline as the charcoal method. However, to keep the result uniform, the charcoal method was continued at the test wells.

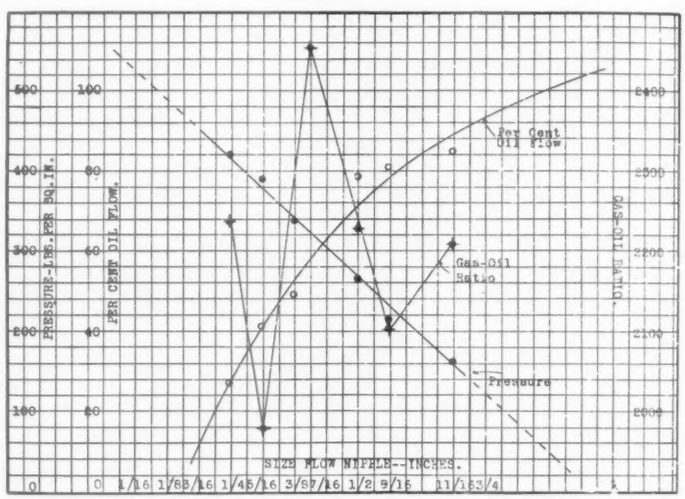
Gas Gravity Determinations. Samples of gas were taken two or three times during a test and gravity readings were made. The average result was taken as the gravity of the gas for that particular test. An "Edwards" gas balance was used in this work.

Temperature Measurements. Daily maximum and minimum atmospheric temperatures were recorded through the tests. Some of the wells under tubing tests were equipped with thermometer wells in the T-connection at the top of the tubing. The temperatures of oil issuing from the wells were recorded for many of the tubing tests. As a rule these temperatures ranged from 70 degrees to 80 degrees Fahrenheit.

Pressure Readings. With a few exceptions, flowing pressures at the casing or tubing heads were obtained in all tests. Pressure-recording gauges were used. These were mounted on wooden standards

(Continued on Page 294)

Plate II.



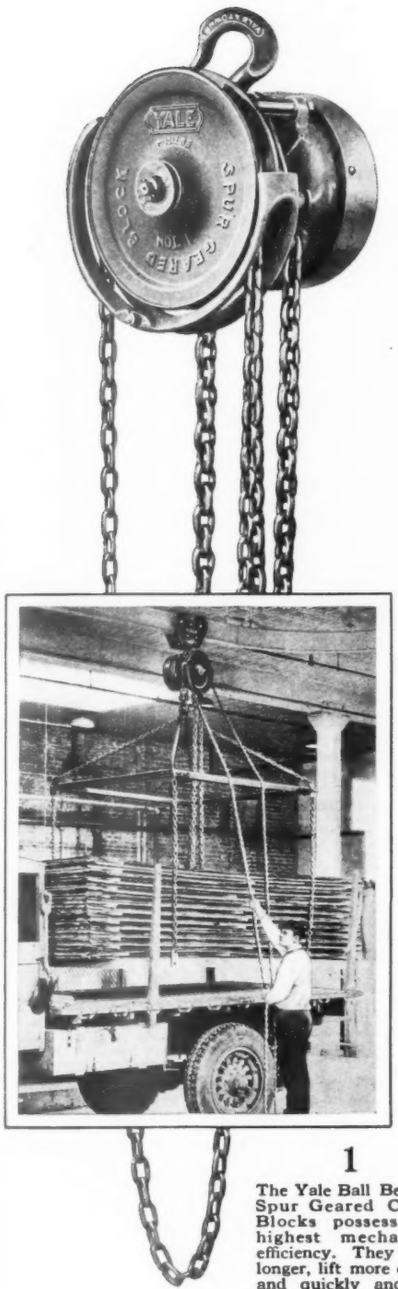
Curves showing relation between flow nipple size and pressure, per cent oil flow and gas-oil ratio in well "A."

COMPARISON OF TUBING NIPPLE FLOW WITH PLAIN TUBING FLOW

	Flow Nipple on Bottom of Tubing									Plain Tub. Wide Open	
	Test 9			Test 9a			Test 10			Test 7	
Well	Size Nipple	Pct. Gas-Oil Ratio	Per Cent Flow	Size Nipple	Pct. Gas-Oil Ratio	Per Cent Flow	Size Nipple	Pct. Gas-Oil Ratio	Per Cent Flow	Pct. Gas-Oil Ratio	Per Cent Flow
"E"	11/16"	83.9	87.5	.....	.....	.....	.....	.....	.....	83.7	92.3
"F"	12/16"	95.8	91.9	.....	.....	.....	4/16"	139.1	54.3	92.8	91.2
"C"	11/16"	104.1	86.5	.....	.....	.....	.....	.....	.....	46.6	64.5
"A"	11/16"	121.7	79.2	6/16"	94.8	51.7	4/16"	88.5	36.8	98.2	82.3
"B"	9/16"	164.4	71.8	5/16"	117.8	69.3	.....	.....	.....	159.5	95.1

TRADE **YALE** MARK

Chain Blocks



1

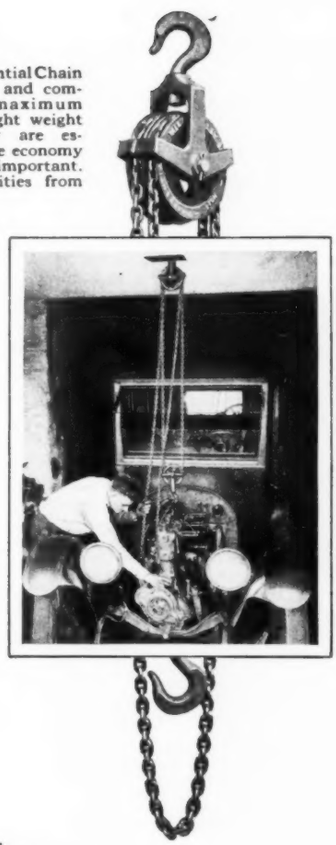
The Yale Ball Bearing Spur Geared Chain Blocks possess the highest mechanical efficiency. They wear longer, lift more easily and quickly and are safer than any other block made. A pull of 77 lbs. on the hand chain lifts a 1 ton load. Made in capacities from ¼ to 40 tons.

2

The Yale Screw Geared Chain Block is portable, light and powerful and takes up less headroom than other types of blocks. A pull of 87 lbs. on the hand chain lifts a 1 ton load. Made in capacities from ½ to 5 tons.

3

The Yale Differential Chain Block is strong and compact, giving maximum service where light weight and portability are essential but where economy of effort is not important. Made in capacities from ¼ to 2 tons.



Which of these YALE Chain Blocks is best for You?

The ever-widening field of uses for chain blocks finds Yale equipped to meet it in every possible respect. Yale Blocks—Ball Bearing Spur-geared Chain Blocks, Screw-geared and Differential Chain Blocks, collectively answer every requirement that ever existed on any hoisting job where saving time, labor and maintenance expense are factors. Individually, you will find one or more of these types of Yale Chain Blocks specifically and preeminently suited to your purpose.

Distributors of Yale Products are fully equipped to advise you without bias as to the right type of block for your work. Inquiry to them or direct to us will bring prompt information.

The Yale & Towne Mfg. Co., Stamford, Conn., U. S. A.
Canadian branch at St. Catharines, Ont.

YALE **Hoisting and Conveying Systems**

YALE MARKED IS YALE MADE

Of Interest to Sales Departments

Short Talks on Specifications

By W. T. Ziegenhain

VAPOR PRESSURE OF NATURAL GASOLINE

The vapor pressure of natural gasoline, as determined by the apparatus prescribed by the Bureau of Explosives of the Interstate Commerce Commission is the pressure exerted by the gasoline at a specified temperature. One hundred degrees Fahrenheit is the temperature specified for the period from March 1 to November 1, while 90 degrees Fahrenheit is used over the four months from November 1 to March 1. The purpose of establishing specifications limiting the volatility of the natural gasoline is to provide greater safety during its transportation and handling and is not intended to serve as an index or limitation with respect to quality as used in an automobile motor.

Natural gasoline, like other petroleum products is made up of a number of different boiling point hydrocarbons, all of which are comparatively volatile. Included in natural gasoline are some dissolved gases and some very volatile fractions which are held as a liquid only by subjecting it to slight pressure or keeping its temperture relatively low. These very volatile fractions exert a pressure just as steam exerts a pressure when water is boiled. The increased volume of the steam or gas resulting from such a small volume of water or gasoline of course is responsible for this. This pressure is proportional to the amount and kind of these light fractions present and they are objectionable if they create too high pressure in the tank car or tank and will probably be lost at the refinery anyway as they are handled and blended with the refinery gasoline even with the greatest care.

But this hazard has been materially lessened during the last few years by the natural gasoline manufacturers, so only a small per cent of the material made now comes near the maximum of 10 pounds pressure, the pressure limit set by the commission.

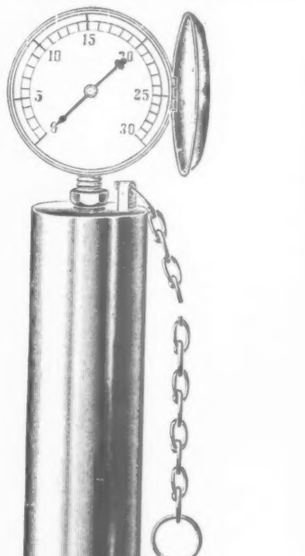
Apparatus Used

The procedure and apparatus used in making the test specifies the use of a cylinder as shown in the accompanying picture. This is a hollow closed metal container equipped with a pressure gauge. The gasoline to be tested is ordinarily in a tank car or tank and in that case the cylinder is lowered slowly into the gasoline after the gauge is removed.

This allows the cylinder to be filled with an average sample and is held in the gasoline long enough to bring the cylinder to the same temperature as the gasoline. If it is impracticable to lower the cylinder into the tank car or tank the gasoline may be drawn into another vessel and then poured into the cylinder, but the cylinder must be emptied and again filled until the temperature of the cylinder and gasoline are the same.

After standing for several minutes the tube is again emptied and a fresh sample drawn. The cylinder is filled and then 1/10 of its volume is drawn off by filling the removable cup provided for this purpose. The gauge is then screwed tightly into position and the cylinder is immersed in water at a temperature of 70 degrees Fahrenheit and allowed to remain there five minutes. Then it is removed from the water and the gauge unscrewed sufficiently to relieve the pressure indicated by the gauge for a period of 20 seconds.

Then the gauge is immediately screwed back into position and the cylinder is immersed in water at a temperature of 100 degrees Fahrenheit (90 degrees Fahrenheit during the period from November 1 to March 1). The level of the water should be just below the low edge of the pressure gauge. After the cylinder has been immersed for 10 minutes and the water has been sufficiently



stirred to cause an even temperature at all times throughout, the pressure is read.

This pressure is corrected in cases where the original sample of gasoline was below 60 degrees Fahrenheit. If the original sample was between 50 and 59 degrees inclusive, 1 pound is deducted from the gauge reading in reporting the vapor pressure of the gasoline. If the temperature was from 40 to 49 inclusive 2 pounds are deducted and 3 pounds are deducted when the sample is below 40 degrees Fahrenheit.

REFINERS SHIPPING WAX IN TANK CARS

Many domestic consumers of petroleum wax are finding it more economical to purchase the product from the refiner in tank cars than in barrels or sacks. Ordinary clean tank cars, equipped with heating coils may be used but these should have ample heating capacity and a double deck of coils hastens the time of unloading. Ordinarily the wax leaving the refinery is packed in barrels or in sacks and the cost of these containers is high and they have little or no salvage value.

In addition to this cost, the wax must be shaved or pressed and the containers weighed individually before and after loading. The cost of this labor together with the cost of loading the car is a big factor. An addition, the transportation costs when using tank cars are somewhat lower due to eliminating the weight of the containers.

An ordinary 8,000-gallon tank car will hold about 30 tons of wax and this is equal to the amount shipped in a large box car. There is no disadvantage in using a tank car for this purpose so far as the refiner is concerned except when there is not enough business to keep the car moving regularly. Ordinarily, refiners do not use their own box cars for barreled shipments and do not have to stand the losses incurred when this equipment is idle. But any loss which may occur through the intermittent movement of the special cars may be readily made up by the above savings.

The customer, on the other hand, when equipped with sufficient tankage and steam heat, can handle the unloading more economically and a decided savings can be effected through less labor needed and no space need to be provided for unpacking, etc.

Explain Gasoline Consumption and Supply for 1927

By H. K. Davis

Statistician, Western Petroleum Refiners Association.

During the first nine months of the current year refinery output of gasoline was 11.4 per cent greater than during the corresponding period of 1926. However, as gasoline shipments were increased 12.7 per cent stocks fell to a level that on September 30 was 10.6 per cent under the quantity on hand on the same day of the preceding year. Exports have shown an increase of only 1 per cent while domestic demand has reached the substantial increase of 14.6 per cent. Table 1 compares the national gasoline statistics for the first nine months of 1926 and 1927 and also shows the trend exhibited by the data as the year progressed:

TABLE 1—GASOLINE INCREASE, 1927 COMPARED WITH 1926

Period of Year—	Refinery Output of Gasoline Pct.	Gasoline Imports Pct.	Gasoline Exports Pct.	Shipped From Refineries Pct.	Gasoline Stocks at Close Pct.	Domestic Demand for Gasoline Pct.
1 Month	20.5	73.9	6.8	1.8	10.9	2.2
2 Months	19.2	47.2	7.5	7.9	12.6	8.7
3 Months	18.3	32.3	6.4	10.5	13.6	11.7
4 Months	16.0	20.5	*0.2	9.7	14.4	11.8
5 Months	13.9	10.1	*0.5	9.5	13.3	11.4
6 Months	12.6	14.6	1.9	10.8	7.3	12.5
7 Months	12.2	4.4	*0.2	11.8	2.0	13.8
8 Months	11.7	*3.8	1.9	12.0	*2.8	13.4
9 Months	11.4	4.0	1.0	12.7	*10.6	14.6

*Percentage decrease.

Both gasoline use and production are subject to independent fluctuation from month to month. There are gradual changes in the seasonal variation in demand due to causes that permanently affect the use of motor vehicles, also more violent changes due principally to the state of general business. Likewise the seasonal variation in gasoline production is gradually altered by changes in the composite opinion of refiners as to the best way to manufacture to meet demand, also more violently altered by revisions in operating policies to meet emergencies arising within the industry. Unless the unusual happens, however, past experience offers a fair indication of about what percentage of the year's total gasoline production will result from operations during any stated period of a normal year.

Years' Demand

Based on an examination of the Government's figures over the past nine years we should say that at the present time the refining industry of the entire country can reasonably expect gasoline shipments during the first nine months of the year to constitute about 74.704 per cent of total shipments for the year and also reasonably expect gasoline output during the same period to constitute about 73.677 per cent of total output for the year. Very gradually from year to year normal percentages of this character are undergoing change. Gradually a larger part of the year's gasoline consumption occurs in winter months and gradually refiners' rate of manufacture more nearly parallels gasoline demand.

However, the reasonableness of the situation was fully explained by the facts at hand. The country experienced a real period of industrial depression during the summer months and a rapid improvement during the closing months of that year. It would have been a most peculiar circumstance had gasoline demand remained unaffected by this depression and recovery and the nine months' shipments from refineries been equal to the normal percentage of the total for the year. Likewise, in view of the fact that during the summer of 1924 refiners collectively possessed the greatest supply of gasoline in proportion to demand in the entire history of refining, it would have been a peculiar circumstance had the industry taken no action to improve the situation and had not gasoline production during the first nine months been more than its normal portion of the total for the year.

Table 2 shows the portion of the year's production and shipment during the first nine months of each year, since the Bureau of Mines has published data that enables such a compilation.

TABLE 2

Per Cent of Year's Total Gasoline Consumed During First Nine Months of Year

	Percentage— Gasoline Shipped From All U. S. Refineries	Gasoline Produced at All U. S. Refineries
1918	75.812	74.262
1919	74.737	73.779
1920	75.166	71.678
1921	75.324	74.545
1922	74.178	72.294
1923	74.633	74.381
1924	73.212	74.125
1925	74.809	74.317
1926	75.195	73.283
Weighted aver'ge	74.704	73.677

Table 3 offers an interesting comparison of operations within the 10 groups into which refineries are divided by the Government report:

TABLE 3—PERCENTAGE OF GASOLINE INCREASE
First Nine Months of Current Over Preceding Year

Refineries of—	Refinery Crude Runs	Gasoline Output	Gasoline Shipments	Gasoline Stocks Sept. 30th
East Coast	16.3	9.2	13.3	*32.3
Appalachian	2.0	2.4	1.1	$2.1
Indiana-Illinois	6.9	6.6	6.5	4.8
Oklahoma-Kansas	5.5	8.5	11.4	*32.3
Inland Texas	3.1	7.0	2.3	100.9
Inland Louisiana-Arkansas	9.5	21.2	19.2	24.7
Texas Gulf	10.7	19.4	19.2	4.5
Louisiana-Gulf	*0.6	12.1	6.7	*43.7
Rocky Mountain	*10.9	*11.3	3.4	*44.4
California	9.5	22.6	23.8	14.3
United States	8.1	11.4	12.7	*10.6
Mid-Continent	5.5	8.9	10.0	*17.0
Gulf Coast	7.3	17.5	15.6	*17.6

*Per cent decrease.

Moved 8 Miles

The Marland Oil Company had this battery of Butler Bolted Tanks at the Thomas Pool (8 miles from Hubbard, Oklahoma, near Blackwell). After serving their purpose at this point the Marland Company desired to move the tanks to a more advantageous position at Hubbard.

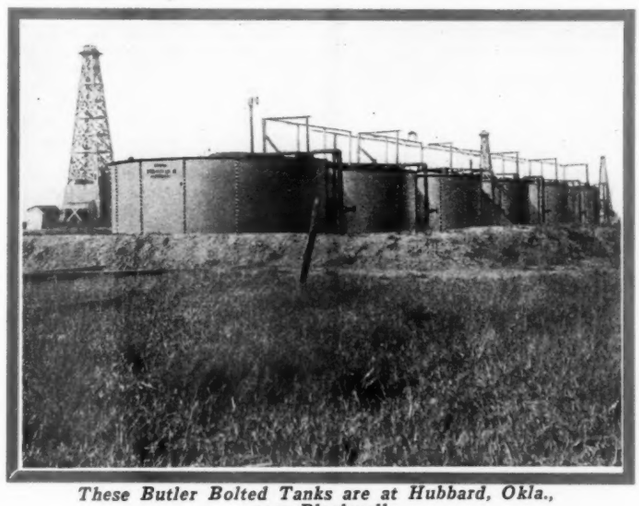
As tanks were Butler Tanks they could be moved with practically 100% salvage. Now they are on duty at Hubbard, near Blackwell.

That Butler Bolted Tanks can be moved is just one of their many advantages.

Consider speed. At *one* time there were in the Big Lake Fields *fifty-four* 1,000-barrel bolted tanks in one row—nearly one-quarter of a mile long! They were all Butler Tanks. This order was given us because these tanks were needed at once to take care of gushing wells. Speed was needed and asked for and delivered by Butler.

Just recently, near McCamey, Texas, another instance of speed was given by Butler. With nine Butler 10,000-barrel Bolted Tanks already up there was urgent need for more storage. An order for 10's was sent in, followed by two more orders in rapid succession for five 10,000 barrels each. Inside of two weeks we were asked to deliver twelve 10,000-barrel bolted tanks! In a few days more the total ran up to 17—all 10,000-barrel bolted tanks.

A demand for service of this high quality is the result of reputation based on the ability of a company to do things in a way that is necessary in the oil field—this is, with speed. *Speed* was the center of our plan in designing our tanks. They are so made that they *naturally* go up quickly! The time saved in putting up Butler Tanks is due in large part to the dependable placement of all holes and the large size and interchangeability of sheets.



These Butler Bolted Tanks are at Hubbard, Okla., near Blackwell.

All holes are punched in Butler sheets by massive machines with tons of pressure. In some gages and sizes of sheets a machine is used that punches *all* holes in *one* body sheet at *one* time! Sheets of heavier gages are also punched with holes in giant machines with multiple gang dies.

Sheets are large. There are fewer sheets to handle. There are fewer seams and therefore fewer chances for leaks.

All sheets are made of blue annealed copper steel or 3/16" tank plates for added strength and rigidity where needed.

The information given here, only in more detail, and many other advantages are shown in the Butler "Oil Field Tanks" Catalog. It will reveal to you why speed is requested and secured from Butler. Send for a copy today.

Protects your men!

The Butler Clean-out Opening is large—measuring 2'x4'! It is not a back breaker. It is convenient for an entire cleaning out of the tank. Because of the size of this opening the work can be done easily, quickly and more safely.

All bolts are removable from the outside!

THESE RELIABLE DEALERS ERECT BUTLER BOLTED TANKS AND ARE READY TO SERVE YOU SPEEDILY:

M & V Tank Co. at Wichita Falls, Olney, Nocona, Cross Plains, Albany, Cisco, Isom, Pampa and Brownwood, Texas.

Drane Humphrey Co. at San Angelo, Big Lake and McCamey, Texas, and Carlsbad, New Mexico.

Drane Tank Co. at Tulsa, Holdenville, Seminole, Hallett and Shawnee, Oklahoma; Eldorado and Madison, Kansas.

M. A. Trimmer at Blackwell, Oklahoma.

Southern Steel Company at San Antonio and Mirando City, Texas.

Champion Supply at Casper, Wyoming.

Thomas Moran at Oil City, Shreveport and Georgetown, Louisiana.

Continental Supply Co., Kevin, Montana.

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Oil "Field Tanks" Catalog contains information on bolted tanks, steel stairs, valves, flow and storage tanks, welded field tanks, etc. Send for a copy today.

Any kind of welded tank made to your specifications.

Butler Manufacturing Company

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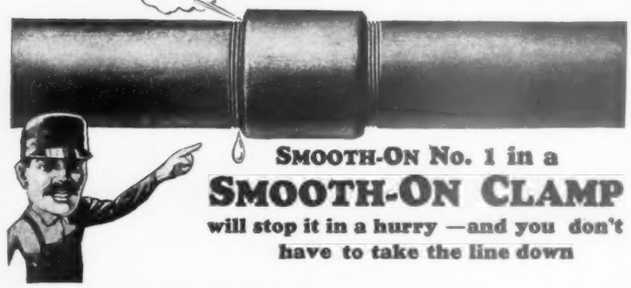
Butler Products include: Ready-Made Steel Buildings, Cans, Funnels, Buckets, Measuring Pumps, Truck Tanks, Underground Tanks, Storage Tanks, Bolted Tanks, Etc. Pipe that can be used as conduit, double well casing or in other ways.

" There's no excuse for that leak! "



SMOOTH-ON No. 1 in a

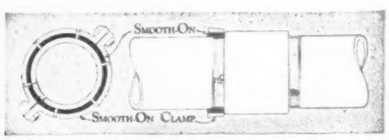
SMOOTH-ON CLAMP

will stop it in a hurry —and you don't have to take the line down

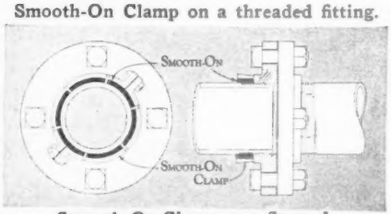
IT'S not like the old days when a lot of joints had to be broken and reassembled to "get" the bad one.

To stop any new or chronic leak at pipe threads, merely put a Smooth-On Clamp around the pipe, shove and tighten it against the coupling, and tamp Smooth-On No. 1 against and into the leak. Expansion of the Smooth-On in hardening will do the rest. You can finish the whole job quickly and it is done **for good.** By good, we mean **good** in every sense of the word—a thoroughly tight joint that holds on iron, steel, brass or copper pipe, at any temperature and pressure, and **for the life of the line.** Under extreme temperature changes the

Smooth-On Clamp. Made in sizes 1 to 12 in.



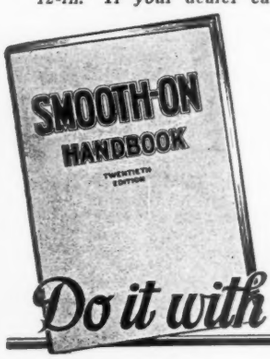
Smooth-On Clamp on a threaded fitting.



Smooth-On Clamp on a flanged joint. No interference with bolts or nuts. Note small space occupied by the clamp.

hardened Smooth-On expands and contracts in unison with the surrounding metal, so the seal remains solid and powerful. If you want to be ready for emergencies, your store room should always contain a few pounds of Smooth-On No. 1 and at least a few Smooth-On Clamps for every pipe size in the plant.

Smooth-On No. 1 comes in 1 and 5-lb. cans and 25, 50 and 100-lb. kegs, and Smooth-On Clamps in all pipe sizes from 1 to 12-in. If your dealer can't supply you write direct to us.



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Twentieth Edition—Completely rewritten—136 pages of new data—193 diagrams, pictures and practical hints on at least 200 different uses for SMOOTH-ON. Every progressive engineer should have this book—get your copy NOW.

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EFFECT OF PINCHING ON GAS-OIL RATIOS

(Continued from Page 290)

driven into the ground about 6 feet away from the well head with one-half-inch pipe connecting the gauge to the proper connection at the well. In tests where tubing was not used, the pipe from the gauge was connected into a swaged nipple of the proper size screwed into the top of the control head. With this arrangement, flow pressures resulting from "pinching" with gates or flow nipples in the lead line adjacent to the well head could be recorded. When tubing was used in the well the pressure gauge line was connected to a tee at the top of the tubing. Unfortunately, the pressures between the tubing and casing were not determined.

Charts were changed on the pressure gauges every day and an average reading taken for each day of the test. A small "bleeder" was connected to the bottom of each gauge, so that the line between the gauge and well could be flushed out by the well pressure when necessary to rid it of paraffin and other accumulations of foreign matter.

Test Wells

The eight wells set aside for testing have been designated by letter, as "A", "B", "C", etc., to avoid constant repetition of well numbers and locations (see Plate 1). The actual well number, location, log, and other data applying to each well are given in an appendix at the end of this report.

The wells were classified into four groups in accordance with their natural characteristics as follows:

Group 1—Wells "A" and "B": Medium sized wells; fairly large "gassers" in proportion to the oil.

Group 2—Wells "C" and "D": Large oil wells flowing more or less steadily, making about 1,000 cubic feet of gas per barrel of oil. These were considered good reliable types of flowing wells in the Salt Creek Field.

Group 3—Wells "E" and "F": Wells flowing by heads; very erratic and hard to regulate by "pinching" to any desired rate of flow.

Group 4—Wells "G" and "H": Wells sluggish and sometimes difficult to make flow at all.

The two wells of each group are only a short distance apart. Those of Group 3 are offset wells, and the others are no greater than three locations apart. (Locations are 440 feet).

Description of Tests

The tests as originally outlined[9] were quite comprehensive. However, after the work was under way, it was found that three day tests, as specified, were not always sufficient, and the time frequently had to be extended until conditions such as oil production, gas volume, and gas-oil ratio were more or less stabilized. Auxiliary or supplemental tests have been designated by the letters A, B, C, etc., and some entirely new tests were added. These have been numbered higher than those specified in the letter of instructions.

The tests are described as follows:

1. "Run a three-day test at 100 per cent production as the wells now stand."

2. "Run a three-day test at 75 per cent production as the wells now stand." (This test was later eliminated as being unnecessary and taking up too much time).

3. "Run a three-day test at 50 per cent production as the wells now stand."

4. "Run a three-day test at 30 per cent production as the wells now stand."

5. "Install flow nipple in lead line near casinghead, of the right size to make the well produce at a steady pressure on the casinghead. Run a three-day test." (This was modified later as a 100 per cent flow nipple test, with a nipple of such size as to give a flow approximately equivalent to 100 per cent casing flow).

5a. An additional test adopted, using a 50 per cent flow nipple in the line.

6. "Run a three-day test with a flow nipple in the lead line near the casinghead, of such size as to make 30 per cent production."

7. "Run a plain string of 2-inch tubing to the top of the sand and run a three-day test at 100 per cent production."

7a. In wells "A" and "B", a supplementary test of adding an additional joint of 2-inch tubing.

8. "Run a plain string of 2-inch tubing to the top of the sand and run a three-day test at 30 per cent production, using either gate or flow nipple in lead line to "pinch" the flow. Tests 4 and 6 will determine whether it is best to use a gate or a flow nipple." (Gate was used).

8a. In wells "A" and "B", while the extra joints of tubing were in, the flow was "pinched" to approximately 30 per cent and this was called an additional test.

9. "Run a plain string of 2-inch tubing to the top of the sand with the same size flow nipple on the bottom, as used in Test No. 5. The lower end of the flow nipple should be reamed so it will be funnel-shaped. Run a three-day test at whatever percentage of production the wells will make." (To give approximately 100 per cent flow).

9a. Supplementary test using the same size flow nipple as in Test 5a on the bottom of the tubing. (To give approximately 50 per cent flow).

9b. Supplementary test using the same sized nipple as in Test 5 at top and bottom of plain tubing.

10. "Run a string of 2-inch tubing to the top of the sand with a flow nipple at the bottom, of the same size as in Test 6. Run a three-day test at whatever percentage of production the wells will make." (To give approximately 30 per cent flow).

10a. Supplementary test using a 30 per cent nipple, the same size as used in Test 6, at the top and bottom of the tubing.

11. "Run a fluid lifter on the 2-inch tubing for a three-day test, at 100 per cent production."

12. "Run a fluid lifter on the 2-inch tubing for a three-day test at 30 per cent production. Pinch in with either a gate —or a flow nipple as determined in Tests 4 and 6."

13. "Run a tubing packer on the 2-inch tubing for a three-day test at 100 per cent production."

14. "Run a tubing packer on the 2-inch tubing for a three-day test at 30 per cent production. Pinch in with either a gate—or a flow nipple as determined by Tests 4 and 6."

15. "With a tubing packer on the 2-inch tubing, run a three-day test with the well entirely shut down 70 per cent of the time and wide open 30 per cent of the time."

16. "Pull the tubing and packer and run a three-day test with the well shut in 70 per cent of the time and wide open 30 per cent of the time."

17. "Run a three-day test with the wells making 100 per cent production and check results against Test 1."

Recording of Results

In recording the results, daily records were kept throughout the duration of all tests, and the performance of all the wells was expressed in averages for pressure, gas volume, gas gravity, gasoline content, oil production and gas-oil ratio. Comparison of results on well efficiencies as expressed in gas-oil ratios are always given in this report in terms of the average for each well in a test.

At the conclusion of every test, figures which were clearly out of line with the more settled results were discarded. This was done particularly with the figures for the first day of a test, where there was an abnormal minimum or maximum amount of oil or gas, caused by the sudden "pinching in" or opening up of a well; thereby confining or releasing a "flush head" of oil and gas.

Retest on Full Production

Such a test is absolutely necessary in running experiments of the kind described in this paper, in order to compare the wide open flow of oil and gas from time to time with the tests per-

[9]Letter of instructions; A. W. Peake, general supt., to D. W. Lewis, supt. of operations in the Salt Creek Field. The Midwest Refining Co., Aug. 1, 1922.

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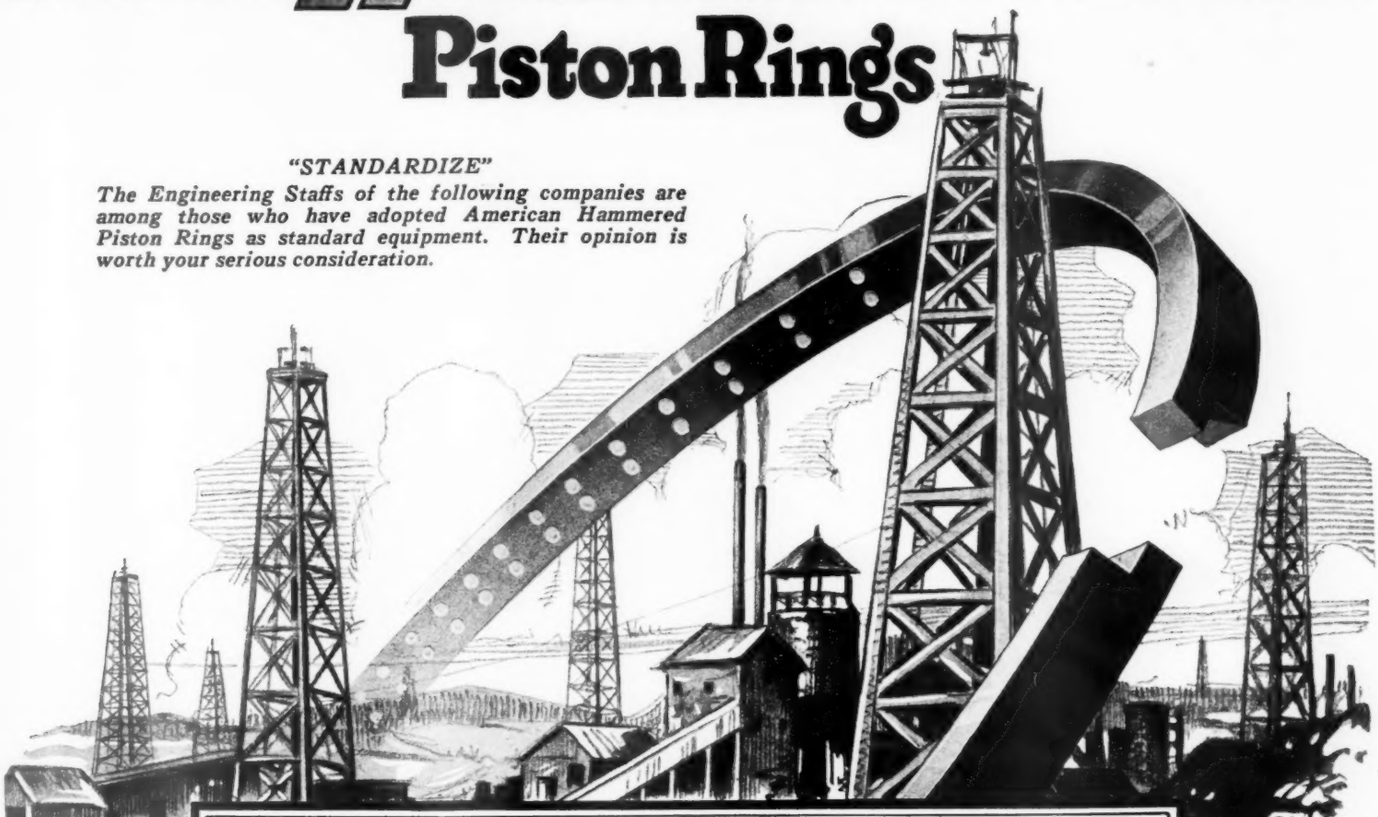

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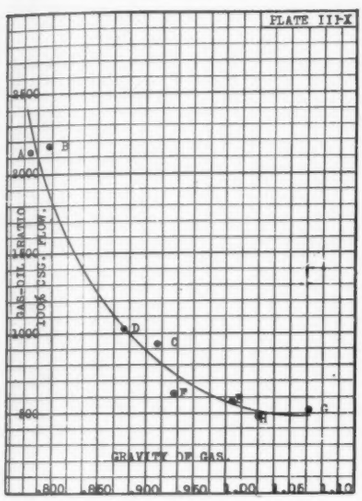
formed. These retests show the oil and gas production decline of the well and the new gas-oil ratio. It is evident that test results secured several months after the original 100 per cent basis was established might not correctly show the relation between other tests.

In the case of the test wells at Salt Creek, the recheck on Test 1, (Test 17), was not made at the time the writer left the work, but an opportunity was provided about one and one-half months after the last test was performed to get the new 100 per cent open-flow basis. At this time all of the wells in the Salt Creek Field were allowed to flow wide open in order to determine their potential capacity. Production figures are available, therefore, on all of the test wells, under date of August 3 to 9, 1923.

It was possible, therefore, knowing the daily rate of flow for each well when the tests started, and also for the period between August 3 to 9, 1923, after their conclusions, to construct curves showing the decline in daily rate. From these curves the open-flow oil and gas production could be estimated for every well during each test; provided of course the well had been given the necessary open-flow tests at intervals during the experimental work. These open-flow decline curves are nearly straight-line curves, in as much as all of the test wells were in their sustained production period.

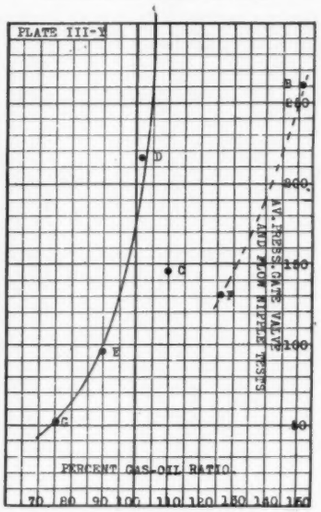
The difference between results correctly based on the new gas and oil production and gas-oil ratios, as compared to the Test 1 basis, is sometimes 3 to 10 per cent. This amount is sufficient to change a particular test from an efficient to an inefficient rating, or vice versa.

Curve showing relation between open flow gas-oil ratio through casing and the average gravity of gas.



Test wells denoted by letters.

Curves showing response of test wells to gate valve and flow nipple tests.



Solid line shows wells which yielded reduced ratios in all or part of tests. Dashed line shows wells which did not respond. Well "C" was an intermediate type.

Tabulation of Data

The results of all tests are given in Table 1. All figures under the main column heading, "Calculated Results," were derived from the computations using the oil and gas production data recorded in the other columns, to the left, for the same test. The percentages given in the subcolumns, "Per Cent Oil", "Per Cent Gas", and "Per Cent Gas-Oil Ratio," were computed on the estimated new 100 per cent open-flow basis.

For example: In Test 2 under well "A" (16A), the figure 2,198 cubic feet (the first column under "Calculated Results") is the average gas-oil ratio of Test 2, obtained by dividing 927,000 cubic feet of gas by 422 bbls. of oil. In the next column the new open-flow gas-oil ratio is 2,127 cubic feet per barrel; derived by dividing the "Estimated Open-Flow Gas Production", 1,140,000 cubic feet, by the "Estimated Open-Flow Oil Production," 536 bbls. The figure in the next column to the right, "Per Cent Oil" is 78.7 instead of 75 per cent as called for in Test 2. This percentage is derived by dividing the "Test Oil Production" of 422 bbls. by the "Estimated Open-Flow" production of 536. The "Per Cent Gas" (81.3) is found in the same manner, dividing the "Test Gas Production" of 927,000 cubic feet per day by the "Estimated Open-Flow Gas" of 1,140,000 cubic feet. The next to last column, "Per Cent Gas-Oil Ratio", is one of the most important, as it expresses in percentage the relation between the test gas-oil ratio (in this test, 2,198) and the estimated open-flow gas-oil ratio (2,127). The computed figure is 103.3 per cent. In other words, flowing well "A" at a 78.7 per cent "pinch" caused it to produce with a gas-oil ratio of 103.3 per cent of what it would if the well had been flowed through wide open casing again. The last column, "Remarks", gives a few important facts relative to each test.

The tests are listed numerically in Table 1, regardless of the time they were run. This accounts for an occasional estimated figure for "open-flow gas," "open-flow oil" and "gas-oil ratio" being at variance with others in the same column, where the test was run at some period of time other than that shown by tests immediately before and after it.

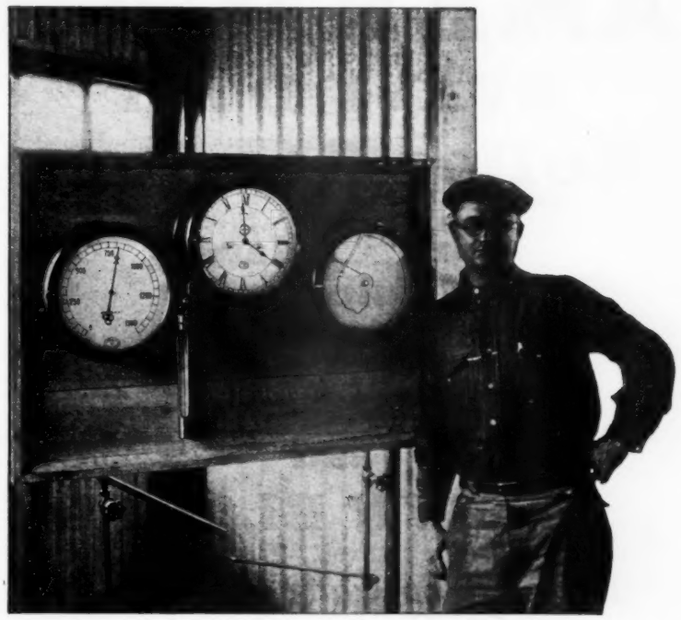
Casing-Flow Tests

Gate Valve Control

In the group of eight wells discussed in this report, all of which were representative second sand flowing wells, 15 casing "pinches" were tried. The control of the well in each test was accomplished by means of a gate valve in the flow line immediately adjacent to the well head. Only five tests reduced the gas-oil ratio below the wide open casing-flow basis. The wells which gave these five reductions in ratio were "C", "E" and "G". Incidentally, these wells were the most consistent in yielding lowered gas-oil ratios through all of the testing.

The testing of all eight wells showed that the reduction of oil flow through casing by means of gate-valve control was usually wasteful of gas except in the case of the three wells mentioned. Although the oil flow can be reduced readily by means of gate valves, there is danger of increasing the percentage of gas above the percentage of "pinch" given to the oil; with a resulting increased gas-oil ratio. This checks the original findings of the Midwest Refining Co. in their testing of the group of seven wells mentioned in the introduction of this report.

Expressed in terms of pressure: increasing the "back pressure" by "pinching" usually increased the amount of gas accompanying each barrel of oil; an undesirable result. Although only two or



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three gate "pinches" were made on a well, there frequently seemed to be a critical point in the percentage control of some wells above and below which the well would yield fairly satisfactory results. This was shown particularly in well "C" with wide open flow, the per cent gas-oil ratio was 100, by definition; at a 47.6 per cent "pinch," the per cent ratio was 128.0; whereas an additional "pinch" to 26.3 per cent flow reduced the per cent gas-oil ratio to 97.1.

In the three wells which consistently yielded reduced ratios, however, there seemed to be no critical point, and each reduction in flow below 100 per cent, with accompanying increased pressure, lowered the gas-oil ratio.

Arranging all of the test wells (except "H") in their order of average efficiency under casing "pinches," based on the total average per cent gas-oil ratio for these tests, they appear as follows:

Well "E"	81.3 per cent
Well "G"	86.2 per cent
Well "A"	103.7 per cent
Well "D"	112.5 per cent
Well "C"	112.5 per cent
Well "B"	122.2 per cent
Well "F"	235.1 per cent

It should be remembered that results below 100 per cent are classed as efficient and those above 100 per cent as inefficient.

Studying all data in connection with the wells such as closed-in pressure, flowing pressure, gas volume, gravity and richness of gas, oil production, and open-flow gas-oil ratio reveals no information having a direct relation to their order of efficiency unless it is the gravity of the gas. The average gas gravity for the two most efficient wells under gate-valve "pinch" is unusually high; 1.10 for well "E" and 1.04 for well "G." For the other wells the gravity ranges between 0.780 and 0.892. There seems to be a general relation between test efficiencies and gas gravities which is of value. Further discussion of this subject is given under the caption, "Specific gravity of gas."

A study of gate-valve "pinch" tests reveals the fact that generally those wells which had the higher pressures under gate-valve "pinch" were more likely to yield high gas-oil ratios and less reduction of ratio; whereas those with smaller pressures gave smaller ratios and a larger chance for ratio reduction. The following table shows this relation:

Well	Av. Casing "Pinch" Pressure	Av. Casing "Pinch" Gas-Oil Ratio	Open Flow Gas Volume (Cu. Ft.)
"G"	37	458	240,750
"F"	66	1021	228,666
"E"	84	503	207,250
"C"	102	991	317,000
"B"	154	2518	384,000
"D"	186	1114	1,052,000
"A"	209	2192	1,141,000

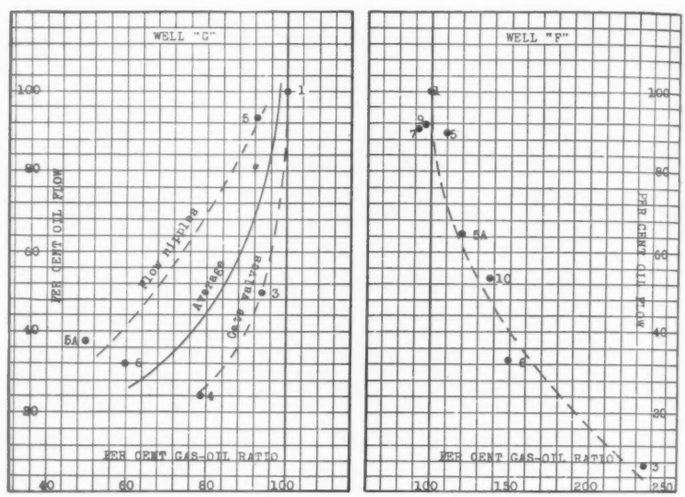
The tests show also that the wells that gave the higher pressures under gate-valve control were usually those with greater open-flow gas volume. This relation was to be expected.

There is a fairly consistent relationship between pressure and per cent oil in gate-valve tests. When the wells were flowing through casing, and in most of the other tests, the pressure varied inversely with the reduction of flow. Curves (not included in this report) were drawn to show these relationships. Their high and low extremities vary between the open-flow pressure at 100 per cent production and the closed-in pressure when the well is shut in.

Table 2, "Chart Comparing Each Test With Wide Open Flow Results," which lists all of the tests involving two or more wells, gives the relative performances of the different wells under casing "pinch." The table also includes the results of all other comparative tests. Under each test the wells are arranged according to efficiency or per cent gas-oil ratio, the most efficient well being placed first.

As the testing progressed it was found that casing-flow "pinches" with gate valves were not always yielding results in reducing the gas-oil ratio. The 75 per cent "pinch" (Test 2), therefore, was eliminated and less time was spent in trying to secure the exact percentage flow. After observing the rate of flow at different periods, throughout a day of manipulating the gate valve and finding that the flow was approximately the desired percentage, the valve was left alone and the well allowed to flow at that percentage for the duration of the test. This was found necessary in order to save time lost in further attempts to control the well. One well, No. "H," could not be pinched at all. If the gate valve were closed the slightest amount, thereby creating back pressure, the well would stop flowing.

Plate IV-X. *Plate IV-Y.*



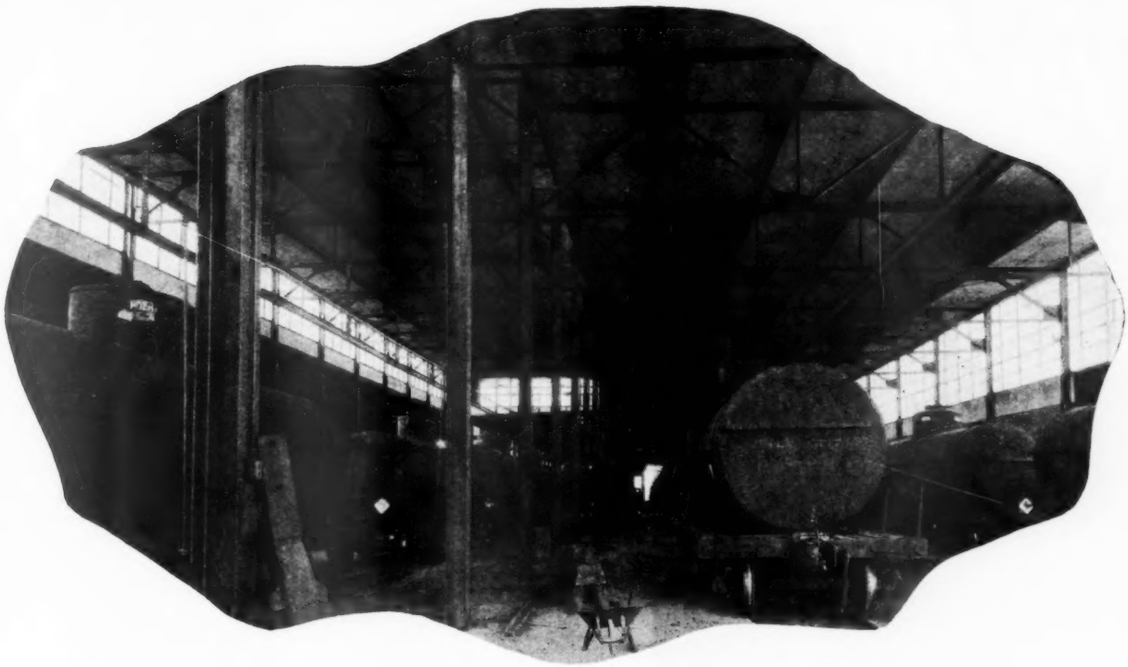
Charts showing reduction of oil flow by different tests and their opposite effects on gas-oil ratios in two wells. Well "G" is efficient and well "F" is not.

As a general recommendation, the writer believes it inadvisable to produce flowing wells at a rate less than the open flow capacity by "pinching" with gate valves, unless it is known definitely that the gas-oil ratio has not been increased thereby. If there is any doubt, the oil and gas production should be accurately gauged with the well flow "pinched," and a study of the resulting gas-oil ratios should be made. Substitute methods for flowing a well under a prorata basis are indicated under the caption, "Stop-Cocking."

The question arises, why should one well have given lower ratios by means of gate-valve control, when another gave an increase in ratios? There were probably many factors which determined this. They are discussed under the caption, "Natural Characteristics of Wells."

Flow Nipple or Bean Control

Tests 5 and 6, inclusive, called for flow nipples of the right size in the lead line near the casinghead to make the well produce at a steady pressure. It was found that almost any nipple chosen would cause the well pressure to be steady. Therefore, flow beans of an estimated



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size to give approximately 100 and 30 per cent flow were used in Tests 5 and 6, respectively. In addition to these tests, an auxiliary test, 5a, was included using a flow nipple of estimated size to give an approximate flow of 50 per cent. This was done in order to supply a third point for plotting, in case it was desired to draw curves showing the performance of the well when flowing through flow beans or nipples. The nipples chosen to give approximately 100 per cent only gave flows from 70 to 90 per cent, but the general influence of flow nipples on well-flow and gas-oil ratios was capable of being observed regardless of the percentage. There seems to be a general relation between the size of flow bean and the percentage flow. This relation is discussed under the caption, "Description of flow-nipples and determination of proper size."

The use of flow nipples in the test wells, on the whole, was more successful than the gate-valve tests. Twenty-seven flow-nipple tests were made, and of this number 12 gave results in gas-oil ratios below the 100 per cent open-flow basis. Every well had some flow-nipple test which gave reduced gas-oil ratios below 100 per cent, except wells "A" and "F." In four wells, "G," "D," "A," and "F," the flow-nipples gave lower per cent ratios than the gate-valve "pinches."

Individual Pressures

A study of individual pressures, in connection with both gate-valve and flow-nipple control of wells, shows that there is no consistent relationship, as the pressure in an efficient test may be about the same as one which is decidedly inefficient. However, taking the average of all the pressures given by all the gate-valve and nipple tests for each well, there is a rough relationship which indicates again that the wells flowing under the smaller average pressures were the most efficient and yielded to pressure control.

The following table shows this:

Well	Order of response to "pinching" shown by average per cent gas-oil ratio for valve and nipple tests combined.	Aver'ge pressures gate valve tests (pounds per sq. inch.)	Estimated average pressures for flow nipples at same per cent flow given by gate valve.
"G"	76.4	50	67
"E"	89.8	106	115
"D"	99.1	243	247
"A"	102.8	270	320
"C"	110.1	132	247
"B"	141.2	200	320
"F"	163.6	100	245

The table also shows that in general the pressures under flow-nipple control were higher than those under gate valve flow. This might have been due to the fact that when nipples were used, the force or impact of the flowing gas and oil against the babbitt core of the nipple was somewhat larger and created more pressure than where the flow escaped through the crescent-shaped opening formed within the gate valve by the body of the valve itself.

The estimated pressures for the flow nipples in the table above were secured from curves plotted to show the relation between pressure and per cent oil flow; mentioned previously in this report. The actual test pressures for the flow nipples were not taken, because the percentage flows of oil under both gate-valve and nipple tests were very seldom the same; and to afford a common ground of comparison, it was desirable to note the pressures under the same per cent flow. The estimated flow nipple pressures are probably accurate to within 5 pounds.

For all of the wells, except "B," "A" and "F," if points were plotted using "pressures" as ordinates and "size of flow nipple in inches" as abscissas, hyperbolic curves were obtained. The data from the three wells mentioned as exceptions gave almost straightline curves. Incidentally, these three wells were the most inefficient of all the wells under test. There is an interesting relation involved in these findings the importance of which is not yet definitely known. Further experiments may show definitely that efficient wells yield curves resembling hyperbolas in plotting the results of "flow-nipple" control, while inefficient wells give straight-line curves.

Careful Study Needed

The same recommendation which was made regarding the "pinching" of flowing wells by gate valves applies to the use of flow nipples in the lead line when wells are flowing through casing. Flow nipples should not be used indiscriminately if a conservation of gas is desired, as it is believed they will not yield reductions of gas-oil ratios below the 100 per cent basis in all wells. Wells of the type of "G" and "E," which had efficient open-flow gas-oil ratios to begin with, may respond to flow-nipple control: but all wells in which it is tried should be studied carefully. Of course, there will always be some size of nipple which will give the best performance, but this may not necessarily result in a gas-oil ratio below the 100 per cent open casing flow basis; and unless this is brought about there will be no need for using flow nipples, except for mechanical reasons.

From the standpoint of facility of mechanical control, the flow nipples are recommended, if curves have been drawn to determine the proper size of nipple for securing different percentages of flow. Of course, as the well declines in pressure, flow conditions will be changed and the nipple size will need to be changed.

Description of Flow-Nipples

The flow-nipples were made in the Midwest Refining Co. machine shops, in the Salt Creek Field. Nipples, 8 inches in length and 3 inches in diameter, the same size as the flow line, were half filled with molten babbitt. As soon as the babbitt was cool a hole of selected size was drilled through the center of this core parallel to the longitudinal axis of the nipple. This round channel was then slightly beveled at each face. The flow-nipples or "beans," as they are sometimes called, were always placed in the line about 2 feet from the control head between a gate valve and union. This position allows the closing in of the well with ease and the breaking of the line at the union to admit the flow nipple in place of the usual 8-inch nipple used between the gate valve and union. At each well, when flow-nipple tests were made, the gate valve ahead of the "bean" was wide open. The well was allowed to flow only through the hole drilled in the core. In the Salt Creek Field it was found that the babbitt in the flow nipples withstood erosion very well, because there was very little floating sand in the oil. In other fields, however, it is sometimes necessary to use steel cores to prevent the sand enlarging the diameter of the hole in the core. Patented flow "beans" may now be purchased from some supply companies.

The prescribed flow-nipple tests called for only two nipples in each well, one of sufficient size to make the well flow at a steady pressure and the other to yield 30 per cent production. After experimenting on wells "A" and "B" with different sized nipples to determine which nipple would yield close to 100 per cent flow, in order to save time it was decided to choose arbitrarily some size which would give a percentage close to 100; as several days might be used in determining the exact size. Another reason for doing this was that any size nipple would furnish data for use in drawing curves, while the large size did not necessarily yield lowered gas-oil ratios. The sizes chosen for Test 5 ranged all the way from three-eighths to 1 inch. The 30 per cent nipples were also chosen arbitrarily. In most instances the choice in sizes was only moderately successful, as the obtained flow percentages ranged from 14.2 to 42.

With two flow-nipple tests completed, it was always much easier to find the size that would yield a percentage close to 50 per cent by plotting on cross section paper the "size of nipple" against

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"per cent flow" in the two tests and connecting these points with a straight line. In this way, for a given percentage flow, the size nipple for producing that flow could be found. All 50 per cent nipples were chosen in this way, with the resulting percentages as follows: 50.2; 38.2; 46.7; 60.9; 64.5 and 37.6. The deviation from 50 per cent occurred because, at first, it was thought that the relation between nipple size and per cent flow could be plotted as a straight line. However, experiment showed that a curve resembling a hyperbola, with its convexity always toward the higher percentage flows, was more nearly correct. The data for well "A" are shown in Plate II.

This method of determining nipple sizes to give certain percentages of flow is important, because quite accurate results can be secured. If it is necessary to produce a well at a certain percentage flow, this can most easily be done by the use of nipples after three or four points have been established in the curve by trial.

This method is probably useful, also, in determining the size of nipple which would actually give the 100 per cent flow and also the minimum size which would cause the well to cease flowing. This is demonstrated in well "G" particularly, where in Test 5, a nine-sixteenths-inch nipple gave 93.5 per cent flow and an extension of the curve indicated that a five-eighths-inch nipple would give the full 100 per cent flow. In working on Test 6 in the same well, a quarter-inch nipple was chosen first, and the well refused to flow. The nipple size was increased to three-eighths inch and the well flowed 31.7 per cent. Extending the curve below this point shows that the well would have ceased flowing when an eleven-thirty-second-inch nipple was used. The curve showed at once what was borne out in the test, namely, that the well would not flow through a quarter-inch nipple, as this size was smaller than the estimated minimum.

Plain Tubing Tests

Tests 7 and 8 required flowing each well through plain 2-inch tubing, with the bottom of the tubing approximately even with the top of the sand. In each well the annular space between the casing and tubing was packed off at the control head, so that all oil and gas had to issue from the tubing itself.

Plain 2-inch tubing was used in six of the eight test wells with the bottom of the tubing placed with the top of the sand. On the whole, the use of tubing was quite successful, as four out of the six wells responded with material reductions in gas-oil ratios.

Well "C" yielded the greatest conservation of gas and heads the list with an average gas-oil ratio of 444 cubic feet per barrel, compared to 951 cubic feet flowing through casing. (See Tables 1 and 2.) The improvement of tubing flow in this well over that of casing flow is further realized when it is seen that 29.9 per cent of the gas lifted 64.5 per cent of the oil and 507 cubic feet of gas was saved for every barrel of oil lifted. Unfortunately, the flowing pressures through the tubing were not recorded on wells "B" and "A." Those which were secured in the other wells seem to vary directly with the efficiency of the well; that is, low pressures at the top of the tubing accompany low percentages of gas-oil ratio and increase with them. (Refer to Test No. 7 in Table 2.)

The use of tubing in the test wells caused them to flow more steadily and eliminated any tendency toward flowing by heads. The reason for this more constant flow is the fact that when tubing is used the oil rises between the tubing and casing to form what is called a "fluid packer"; also the retarded oil flow helps to prevent the periodic expulsion of oil from the sand. As a matter of fact, it is common practice in most fields to run tubing in a well when the fluid starts "heading" through the casing. It is suspected that the wells which gave poor results under open-tubing flow had low static fluid levels which allowed excessive by-passing of gas; but this is not known definitely.

The pertinent facts relative to the behavior of the different wells under tubing flow are shown in the following table and also in Table 2. They are listed in their order of efficiency based on greatest reduction of ratios.

TEST NO. 7

Well	Pct. Gas-Oil Ratio	Gas-Oil Ratio	Pct. Oil Flow	Tubing Head Pressure (lbs. per sq. in.
"C"	46.6	444	64.5	12
"E"	83.7	506	92.3	14
"F"	92.8	595	91.2	25
"A"	98.2	2,114	82.3	*50
"D"	100.8	1,085	59.1	7¢
"B"	159.5	3,459	95.1	*30

*Estimated.

Although "C" gave the largest reduction in gas-oil ratio, 53.4 per cent, the oil was reduced 35.5 per cent; in other words, for every 1.0 per cent the oil was reduced there was a reduction of 1.5 per cent in gas-oil ratio. In well "E," however, the reduction in ratio was 16.3 per cent and the oil only 7.7 per cent; or 2.1 per cent in ratio for every 1.0 per cent in oil. From the standpoint of greater gas-oil ratio reduction without too great a sacrifice in oil, well "E" probably gave the best results.

It is generally known that the location of the tubing in a well, together with its diameter and length, affects possible efficiencies which might be secured; and it is suggested that operators perform experiments which will give light on this subject. In the Salt Creek tests, alternation of tubing depths was not tried for various reasons, except in one instance in well "B" after Test 8 had been performed on well "A." Test 8 (flow through 2-inch tubing "pinched" to 26.9 per cent—intended 30 per cent "pinch") yielded such a remarkable reduction in gas-oil ratio for "A" (see Tables 1 and 2) without a corresponding reduction for the same test in well "B" that an investigation was started to determine the reason for it. Several factors were investigated, and it was found that according to the well log of "B," the 6⅝-inch casing was set into the sand 23 feet, and apparently the tubing was not placed at the effective or exposed top of the sand, but 23 feet above it. It was decided, therefore, to place an extra joint of tubing in "B," so that the bottom of the string would be even with the bottom of the casing and the top of the exposed sand. Later, however, it was learned that the casing had been set correctly but the amount of casing used in the well had been recorded incorrectly on account of "over-all" or warehouse measurements. This discrepancy caused the insertion of an extra joint of tubing for two additional tests. Observations were made in well "B," therefore, on tubing wide open and "pinched" to approximately 30 per cent flow when the bottom of the tubing was at the top of the sand (Tests 7 and 8) and also when it was set 23 feet below the top of the sand. With the tubing in the latter position, the tests were called Tests 7a and 8a.

Position of Tubing

Well "B," under Test 7, with tubing at the top of the sand, gave 168 bbls. of oil and a gas-oil ratio of 3,459 cubic feet per barrel, or 159.5 per cent of what it would have been if the well flowed wide open through casing. With the tubing set 23 feet below the top of the sand (Test 7a), the well produced 152 bbls. of oil per day and an increased ratio of 3,994 cubic feet per barrel of oil. This fact shows that altering tubing positions does make a difference in gas-oil ratios; and it indicates that much better results might be secured by having the bottom of the tubing even higher than the top of the sand; thus allowing a larger static head of oil to accumulate and serve as a "fluid packer."

In a flowing well drilled into the first Wall Creek sand on Section 26, early in the summer of 1926, an initial of approximately 2,000 bbls. per day was secured. A few weeks later, this well was tubed with 2½-inch tubing and the bottom of the tubing placed in the lower part of the sand. It is reported that the oil flow was very greatly decreased and an enormous amount of gas produced instead. This checks with the results noted in well "B."

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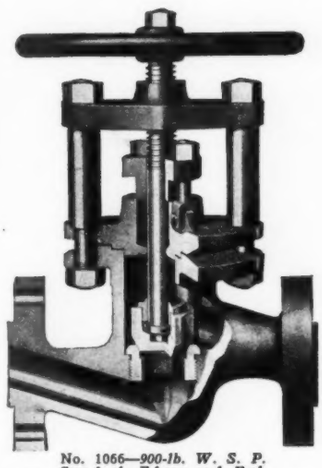

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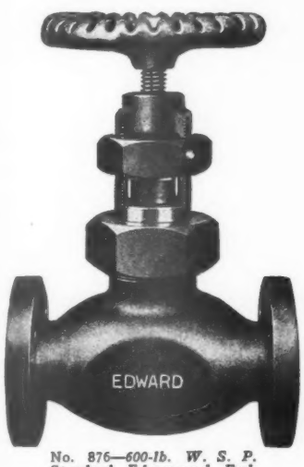

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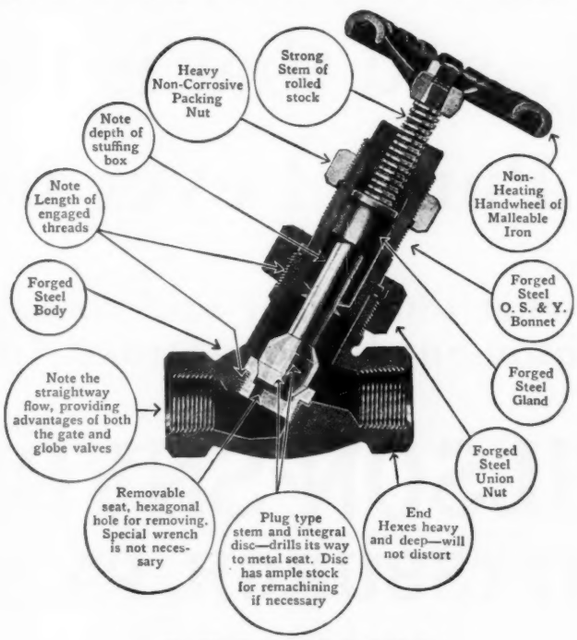
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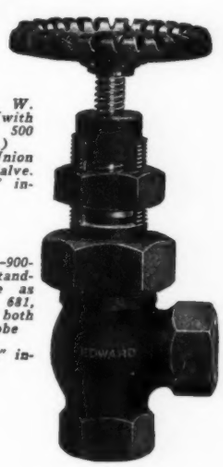

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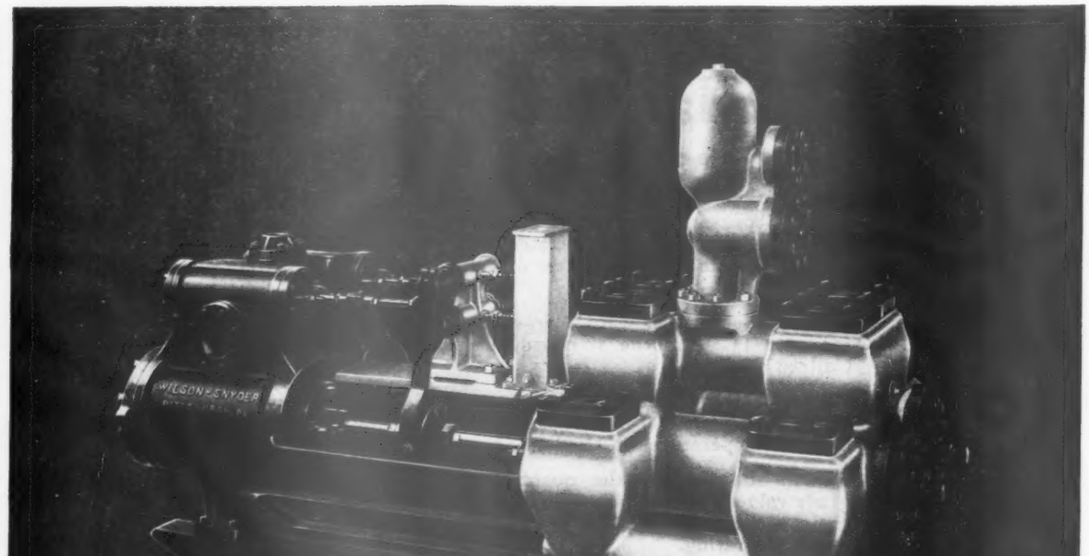

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in March, 1926, 9 were flowing through tubing with an average gas-oil ratio of 549 cubic feet per barrel, and the average well production was 1,334 bbls. per day. The individual well production ranged from 166 bbls. to 2,800 bbls. The remaining 12 wells were producing through casing with an average ratio of 697 cubic feet per barrel and an average oil production of 1,881 bbls.; the individual well production ranging between 177 bbls. and 4,455 bbls. All of the Lakota sand wells were new and in their flush period of production when every well is most efficient; but even then there was a difference of 21.2 per cent in gas-oil ratios in favor of the tubed wells.

In general it is believed that most wells will be helped in decreasing their gas-oil ratios below the open casing flow basis by flowing them through tubing placed at the proper depth. Of course, there may be exceptions, and the individual wells, must be studied. In other fields, also, it has been shown that nearly all wells, except very large ones, will flow through tubing with better efficiency and less gas than through casing. Combination strings of tubing of several different sizes in a well have been known to yield good results, starting at the bottom with a small diameter and increasing the size as the top of the well is reached. These combination strings serve as expansion chambers in which greater efficiency is obtained from the gas.

There is one danger in using tubing in a flowing well where the oil has a paraffin base, as indicated by the Salt Creek tests, and that is the possibility of paraffin trouble. This is shown by well "C," where the production through tubing declined 81 bbls. in 15 days. This decline was entirely due to paraffin accumulations on the walls of the tubing. The tubing could have probably been placed in some position where the trouble with paraffining could have been held to a minimum, however. A test described later under the caption, "Stop-Cocking Test," eliminates this trouble.

Tests 7 and 8 were not tried in some of the wells, due to inclement weather and other conditions over which there was no control. Well "H," flow conditions were at a very critical balance, and the application of any back pressure whatever was enough to make the well stop flowing. Even with tubing and packer in the well, it had a tendency to "die," and occasionally had to be agitated by closing the valve a few minutes and then releasing the accumulated pressure. Better results might have been secured, however, if the tubing had been placed at different depths.

Gate-Valve "Pinch"

Test 8 covered tubing flow "pinched" to approximately 30 per cent, by means of a gate valve or flow nipple at the surface and also the use of flow nipples at the bottom of the tubing (see Table 2).

Strange to say, well "A" which up to this time had yielded very mediocre results, was the most efficient, yielding an astonishingly low gas-oil ratio of 716 cubic feet per barrel, compared to 2,158 cubic feet per barrel, if the well had been flowing wide open through casing. In this well 26.1 per cent of the potential oil production was produced by 8.4 per cent of the gas.

Well "C" also gave good results, as the ratio was reduced from 956 cubic feet per barrel, the open flow casing figure, to 480 cubic feet per barrel. This last result, however, was not quite as good as that obtained by producing through wide open tubing. The comparative efficiencies of the wells under Test 8 are given in Table 2. It should be stated, however, that in one sense, well "C" was inefficient under Test 8, as in five days' time the well stopped flowing, due to the tubing having been plugged with paraffin. The average results on "C" for this test were based on results secured in three days' observations before the well stopped flowing.

The well was closed for a few days in order to accumulate pressure. When it was opened up, the well started flowing again by flushing out the paraffin. An effort was then made to produce the well under a 40 per cent "pinch," but it flowed continuously at 21 per cent, so the results were taken and recorded as Test 8b in Table 1.

In general, the tests indicated that some wells will yield reduced ratios with tubing-flow "pinches" and others will not. There is no definite relationship and the performance of the wells will have to be determined by trial tests. A sacrifice in daily production will also have to be made with restricted tubing flow. It should be noticed that under both Tests 7 and 8, the wells which gave reduced ratios also had the richness of their gas increased. (Refer to Table 2.)

Flow Nipples on Bottom of Tubing

Tests 9 and 10 called for flow nipples of the same size as those used in Tests 5 and 6 on the bottom of plain 2-inch tubing. In as much as an auxiliary test, 5a was utilized earlier in the test period to secure an approximate 50 per cent flow through a flow nipple, its equivalent or companion test, 9a, was designated, using the 5a size nipple on the bottom of the tubing; so that Tests 9, 9a and 10 were "tubing flow-nipple tests."

Only nine tubing flow-nipple tests were tried, and for these, four yielded results in gas-oil ratio reductions below the Test 1 basis. The flow nipples on bottom of tubing were used with the thought that a restriction at the bottom would cause the tubing to serve as an expansion chamber which would allow a more complete expansion of gas against the oil after it had passed through the nipple.

A sufficient number of tests with nipples placed at the bottom of the tubing were not run to warrant condemning the method, although on the whole, results were not as good as with plain tubing. The additional disadvantage of pulling tubing every time a nipple change is desired, is costly. An adjustable flow nipple controlled from the derrick floor is now being placed on the market.

The accompanying table gives as summary of tests with flowing nipples on the bottom of tubing, and a comparison with plain-tubing flow.

The table shows that wells "A" and "C," which gave reduced ratios in Test 8, yielded unsatisfactory results in Test 9, with flow beans at the bottom of tubing. More gas was used in lifting the oil by means of flow nipples than would have been necessary in flowing through casing. In Tests 9a and 10, however, the gas factor was reduced in well "A." Apparently the size of nipple plays an important part. Wells "E" and "F" gave good results; and it is interesting to note (Tables 1 and 2—Test 9) that these two wells had the smallest working pressure at the top of the tubing and the smallest open-flow gas-oil ratios through casing. As a matter of importance, it should be noticed also that the "per cent gas-oil ratios" in Test 9 increased directly with these "open-flow casing gas-oil ratios." In other words, where there is too great an excess of gas, the restriction at the bottom of tubing merely serves as a "gas gun" and causes an increase in the by-passing of gas. This can sometimes be controlled by "pinching" at the top of the tubing.

R. Van A. Mills, representing the Bureau of Mines in the testing, suggested the use of flow nipples at both the top and bottom of 2-inch tubing; thinking that the tubing would serve as a better expansion chamber, insure a better mixing of the expanding gas and oil and yield lower gas-oil ratios. This type of test was performed on both wells "B" and "A." It was first tried on "A," with the quarter-inch flow nipple, which had given a 36.8 per cent flow when on the bottom of the tubing. The same size was used at both top and bottom. The test was called 10a and extended over 20 days' time. The use of the two nipples increased the flowing pressure at the top of the tubing from 38 to 335 pounds; lowered the oil from 188 bbls. to 115 bbls. per day; and increased the gas-oil ratio from 1,947 to 2,201 cubic feet, although this figure gave a gas-oil ratio percentage of 99. There was a small saving of gas.

In well "B" the results were better, and it is interesting to know that during all the months spent in testing, the use of the two nipples in Test 9b was

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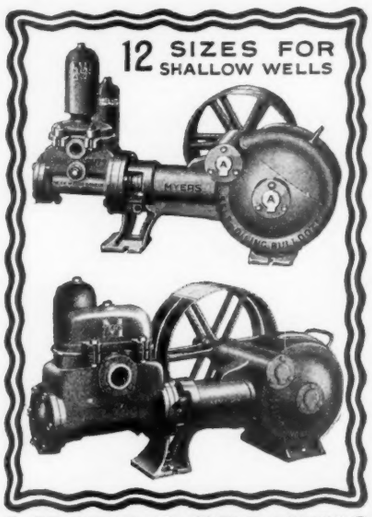

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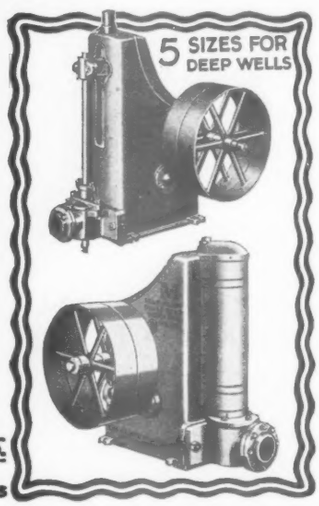

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the only combination yielding a reduction in the gas-oil ratio below the 100 per cent open-casing flow figure. Nipples of three-eighths-inch size were used and the ratio was reduced to 2,121 cubic feet per barrel, or 96.5 per cent of the open-casing flow basis. (See Table 1.)

Apparently this type of test or method of flowing wells, similar to that tried on "B," will yield results, and it is regretted that further tests of this nature were not made. This method suggested other similar mechanical devices which might be used advantageously. Among these would be the placement of orifices or restrictions at specified intervals throughout the entire length of the tubing, or the use of smaller size tubing, such devices might have the tendency to prevent excessive by-passing of gas and secure better efficiency.

All of the flow nipples used on tubing were constructed in the same manner as those used in the flow line, except that 2-inch pipe was used.

"Stop-Cocking" Test

After the regular tubing tests were completed on well "C," a supplementary test, called Test 18, was adopted, calling for producing the well wide open one day and closing it in the next. This test extended over a period of two weeks, and the well flowed through plain 2-inch tubing as in Test 7. The test was adopted to see whether accumulations of paraffin in the tubing could be eliminated.

The average daily production for the time the well produced was 266 bbls., as compared with 216 bbls. for Test 7. The gas-oil ratio was 380 cubic feet per barrel, as compared with 444 cubic feet when producing through open tubing every day in Test 7.

Alternate days of producing or "stop-cocking" completely eliminated the accumulation of paraffin noticed in Tests 7 and 8, due to the sudden release of pressure and the flush head of oil every time the well was opened. During the time the well was shut in, the closed-in pressure would build up and vary between 500 to 510 pounds per square inch.

Of course, producing a well on alternate days cuts its producing time in half and therefore reduces the total amount of oil production; but the reduction is not in the same proportion. For example, the total production for well "C" under Test 7, tubing flowing wide open, was 3,455 bbls.—an average of 215.9 bbls. per day. Under Test 17, with nine producing days the total was 2,392 bbls., an average of 265.7 bbls. per day, or an increase of 49.8 bbls. per day. Another way of expressing it is that the well in Test 7 required 10.1 flowing days to produce the same amount that it produced in 9 days under Test 17. The operator should determine which method is more adaptable to his conditions; whether it is better to curtail production for the benefit of efficiency, or whether it is more important to secure the maximum production. For the duration of Test 7, a total of 221,120 cubic feet of gas was wasted, on the basis of Test 17 using 64 cubic feet of gas per barrel less in lifting the oil. This amount of gas would have brought 581.8 bbls. of oil to the surface under Test 17.

In a field where prorating is in effect, it is believed that producing the well long enough each day to secure the proper percentage of oil and then closing it in will prove to be the best practice. At least the Salt Creek test indicates this, and the method should be tried out in other fields with all data pertaining to gas and oil volumes collected.

Use of Fluid Lifters

Up to the time the testing was discontinued the tests requiring the use of special fluid lifters or "flow devices" had not been tried, except in wells "A" and "B."

These tests were very unsatisfactory and will not be described in detail. The results may be seen by referring to Table 1. All of the fluid lifter tests were so inefficient that their gas-oil ratios were increased to 171 and 280 per cent of the open flow through casing.

The so-called "fluid lifter" used was simply a homemade flow device attached to the bottom of a tubing string and intended for flowing the well at maximum production with the least gas energy. In the test work two types of "fluid lifter" were tried. These are called the "rope socket" and "swaged nipple" types.

The fluid lifters were placed on the bottom of the tubing string even with the top of the sand. The rope-socket fluid lifter was of simple construction and consisted of an ordinary drilling rope-socket with the swivel removed. The top or neck of the socket was machined and threaded so that it could be screwed on 2-inch tubing. Six holes were drilled into the main body of the socket. These were spaced evenly around its circumference at an angle projecting upward into the socket cavity. Apparently these holes or jets served only as additional avenues of escape for the gas to the exclusion of the oil.

The swaged nipple fluid lifter consisted of a 2 by 5⅞-inch swaged nipple at the bottom of the tubing string with a 2-inch collar welded inside of it at the small end; to allow the insertion of a joint of perforated 2-inch tubing. Below the perforated joint there was placed enough tubing to serve as an anchor, resting on the bottom of the hole.

It was thought that the swaged nipple might have the tendency to cause all gas to flow through the tubing perforations and jet the oil through the tubing to the surface. Actually the device caused so much gas to enter the tubing that a high gas-oil ratio resulted.

Generally speaking, the use of the above types of so-called fluid lifters will probably prove inefficient — particularly in the type of well represented by wells "A" and "B." Only detailed testing will show their value in any field. There are some flow devices on the market that have given good results.

Tubing and Packer

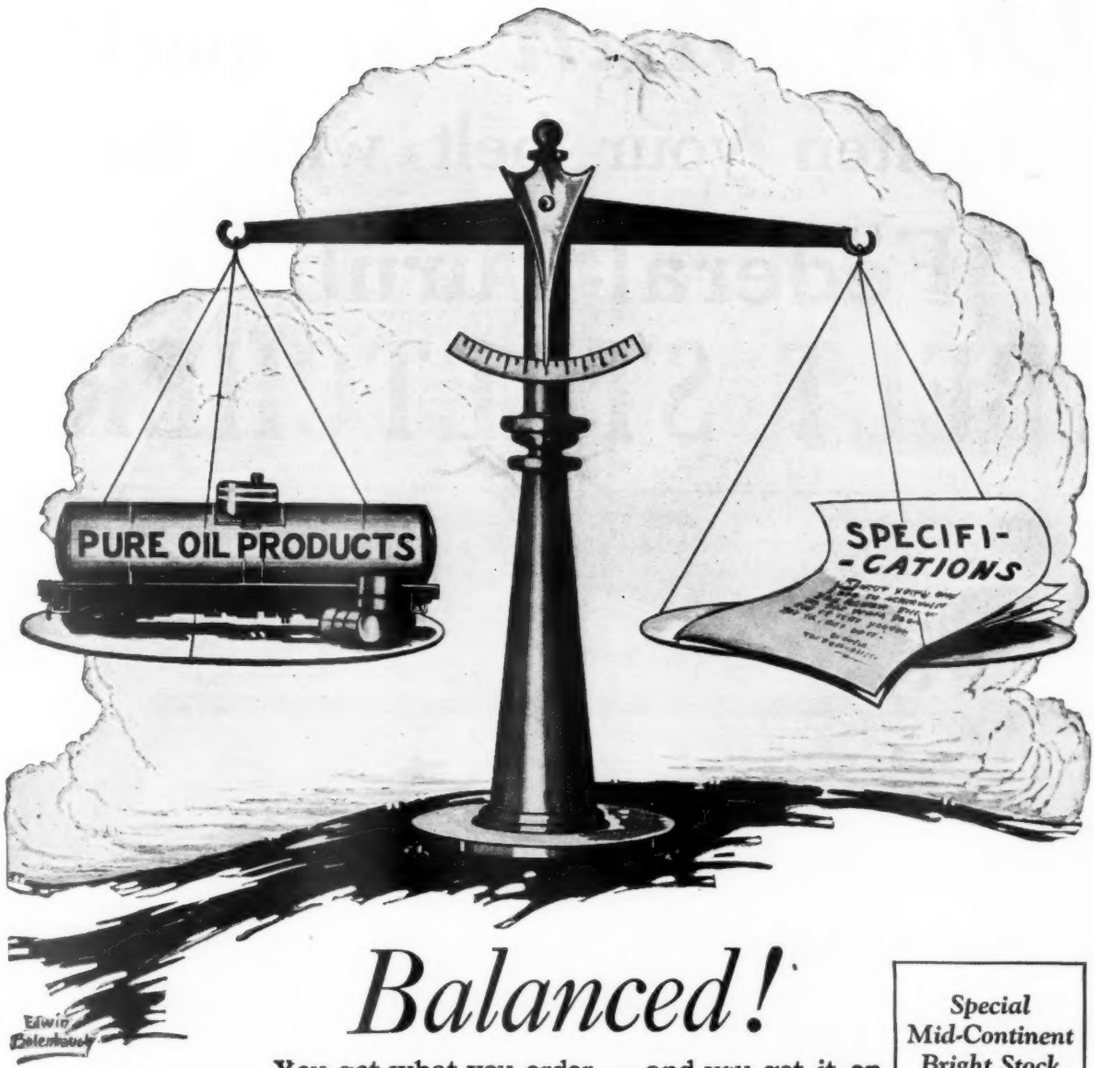
Tubing and packer were used in only three of the test wells, "A," "B" and "H," under Test 13; although had the work been continued they would have been tried in all of the test wells. In each case the packer and bottom of tubing were placed at the top of the sand. Only medium results were obtained, and in "B" they were very unsatisfactory. In as much as well "H" was sensitive and quit flowing under back pressure it was thought that tubing and packer would be beneficial, so it was tried, and gave some reduction in the amount of gas, the percentage gas-oil ratio being 83.4.

Test 15, with the well closed in 70 per cent of the time and producing 30 per cent of the time through 2-inch tubing and packer, was tried on wells "A" and "B" only. Test 15 probably would have caused well "H" to stop flowing. Accordingly, it was not tried. The following table shows the comparison between tubing and packer and plain 2-inch tubing.

Well	Test 7 Per Cent Gas-Oil Ratio 2" Tubing	Test 13 Per Cent Gas-Oil Ratio—Tubing and Packer	Test 14 Per Cent Gas-Oil Ratio; Tubing and Packer "pinched" to 30 Pct.	Test 15 Per Cent Gas-Oil Ratio; Tubing and Packer Producing 30 Pct. of 24 hrs.
"B"	159.5	351.4	....	298.7
"A"	98.2	117.7	90.6	109.8
	Casing Flow			
"H"	100.0	83.4	....	.....

Test 14, consisting of "pinching" the flow through tubing and packer to approximately 30 per cent, was tried on "A" only, and it gave a slight reduction in gas-oil ratio as shown in the table. A flow of 24.4 per cent was the actual result and this amount of production was lifted by 22.2 per cent of the gas. Here again, "pinched" tubing-flow was beneficial to "A."

The last tests performed before the testing was discontinued were known as 15 and 15a and were confined to wells "A" and "B." Test 15 consisted of pro-



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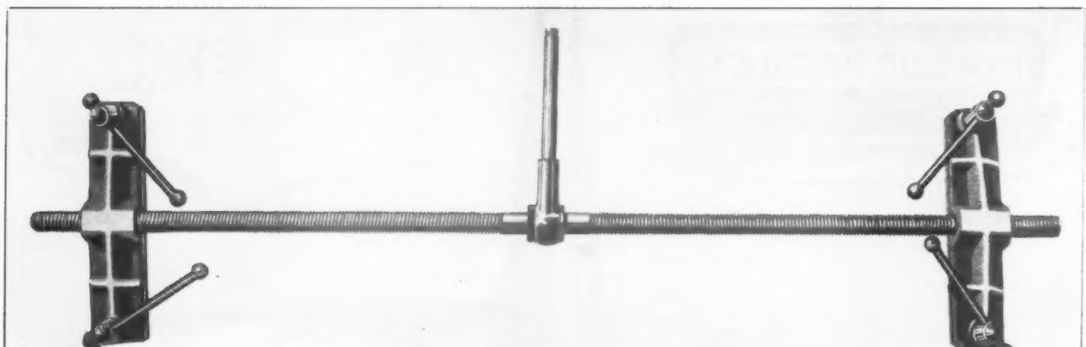

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ducing the well through tubing and packer 30 per cent of every 24 hours, or for seven hours and 12 minutes, and closing it in for the remaining portion of the day. This test was run for four days on "A" with an average per cent gas-oil ratio of 109.8 and "B" for eight days, with an average per cent gas-oil ratio of 298.7. These results were very inefficient (see Table 1). In order to determine whether better results could be secured, a test was run with the "booster" or vacuum system taking the gas for the seven-hour period. This was done to eliminate the few ounces back pressure which might exist in the trap due to the gas flowing from the trap through an 800-foot line to atmospheric pressure. This test (15a) was run three days. The volume of gas was reduced slightly; the oil increased from 87 to 98 bbls.; and the per cent gas-oil ratio was cut from 109.8 to 94.8. This test was important, as only the elimination of a few ounces of pressure made the difference in the well performance. This pressure difference was so small that it was not registered on the pressure gauge at the top of the tubing column.

Well	Average per cent Gas-Oil Ratio for Gate Valve and Nipple Tests	Average Gas-Oil Ratio	Average Pressure	Average Per Cent "Pinch"
"G"	76.40	392	52.4	47.30
"E"	89.88	525	97.8	52.84
"D"	102.25	1,062	216.6	50.60
"A"	105.58	2,269	319.0	49.48
"C"	110.10	1,025	146.0	41.98
"B"	151.32	3,279	259.0	50.22
"F"	153.60	877	123.5	48.35

General Discussion of Results

In the foregoing section of this report the different types of tests or methods of producing the flowing wells and the results secured under each have been described. In the following paragraphs certain conclusions, based on the results of these tests, have been drawn. To begin with, the writer wishes to emphasize the fact that the results secured in Salt Creek may be peculiar to that one field alone, and, pending the completion of similar tests in other fields, it is not known whether the flowing wells of other fields will give the same results or yield to the same treatment. However, it is believed that the Salt Creek tests will point the way to a better understanding of the gas-oil ratio problem and to methods which will give material reductions in these ratios in flowing wells. It is hoped that further work in line with the tests made in the Salt Creek Field will be undertaken by various operators, and that fundamental rules will be evolved which will be applicable to the entire study of controlling flowing wells.

It has probably been evident to those reading this report that the different wells tested were individual problems by themselves, and, with a few exceptions, no two gave the same results under the same test. This should be expected, as there are many variable factors which probably play a part, such as depth and age of the well, sand conditions, size of casing, volume of gas and oil, cycles of flow, location of well with respect to tank batteries, length of flow line.

Reference to Tables 1 and 2 will show that out of the eight wells tested only two responded and gave reduced gas-oil ratios in every test. Well "H" was not counted because it would flow only in Tests 1 and 13. Well "B" in 19 tests gave only one reduction of gas-oil ratio below the open-flow basis. In Table 2 it will be seen that the same two or three wells head the list in efficiency, or rank second or third place, in the tests to include Test 9. It is important to note that in all the tests made, which were common to at least five, and generally six or seven of the wells, "E" is found in first place in three out of eight tests; in second place three times; and in the third place twice. Well "G" is found in first place twice out of eight tests; in second place twice; and in third place once; tests 7, 8 and 9 were not used in this well.

In other words, it is possible to pick out the wells which were most susceptible to giving ratios under control. As an index to this ability to yield efficient results, an average per cent gas-oil ratio was found for every well, using only the tests common to each, which were Tests 3, 4, 5, 5a and 6; (flowing through casing).

Test 2 is eliminated, as it was only used in wells "A" and "B". The results are shown in the following table.

Using these figures and plotting "average pressure" against "percentage gas-oil ratio" Plate 3-Y is obtained, which indicates roughly that as the "working" or "back pressure" of a well increases, the less chance there is to get satisfactory results. In other words, it was found in the Salt Creek Field that wells with average working pressures less than about 130 pounds per square inch were the ones that responded most efficiently to pressure control and gave reduced ratios. Wells producing above 130-pound pressure were the inefficient ones and yielded increased gas-oil ratios when the flow was "pinched." In the former type of well (one of low initial gas-oil ratios) there seemed to be a definite relationship which showed that as the percentage flow was reduced (equivalent to increase in back pressure) the gas-oil ratio was reduced (see Plate 4 and 10). The writer prefers the terms, "flow being reduced" rather than "back pressure," due to the fact that there is a less clear-cut relation between "pressure" and "gas-oil ratio" than there is between "per cent flow" and "gas-oil ratio". This is due to the fact that frequently an additional restriction of flow will cause a smaller pressure than that which prevailed before.

In the inefficient well (one of high initial gas-oil ratio) it was found that pressure and per cent flow had the opposite relation, in that decreasing the flow (increasing back pressure) had the general tendency of increasing the gas-oil ratio (see Plate 4-Y).

These two relationships between the efficient and inefficient well, so far as the wells in the Salt Creek Field are concerned, seem to be fundamental, and the writer expects to see them apply in other fields. The main problem is the identification of these two classes of wells in the field without the expenditure of time and money in detailed test work.

Natural Characteristics of Wells

Obviously, the features capable of identification will have to be natural characteristics. These include open-flow pressure, closed-in pressure, open-flow gas volume, age of the well, gravity of gas, open-flow gas-oil ratios, and others. To determine any relation which might exist, the wells have been listed again in order of their efficiency in response to control, with all of their possible natural characteristics listed after them. These are shown in Table 3.

Table 3 includes seven columns which indicate possible, though sometimes not clear-cut, relationships and the adaptability of the wells to pressure control. These relationships seem to lie in:

1. Closed-in pressure.
2. Specific gravity of gas.
3. Structural position (elevation of sand above or below sea level).
4. Thickness of sand.
5. Age of the well.
6. The amount of decline in oil per month.
7. Size of casing.

Each item is discussed in turn.

Closed-In Pressure

The data indicate that the smaller the closed-in pressure the greater will be the response in securing reduced gas-oil ratios through the control of flow. Well "G" had a recorded closed-in pressure of 200 pounds, but subsequent tests showed this to be low and that a potential closed-in pressure of 450 pounds was possible. From 450 pounds the pressure increases with the increase in percentage gas-oil ratio, as shown in Table 3. Well "B" has a slightly lower closed-in pressure than would be expected, but

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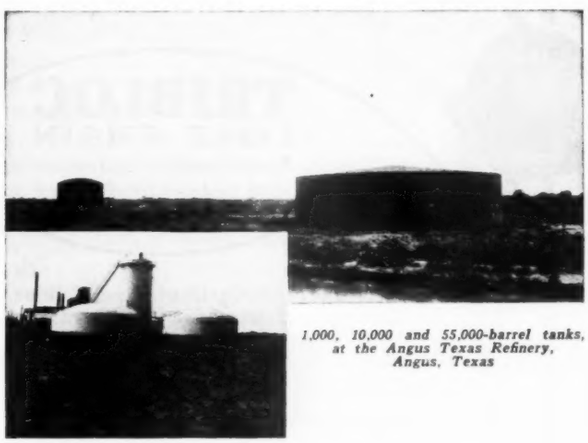

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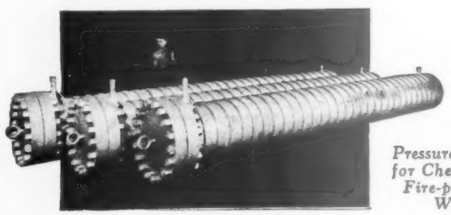

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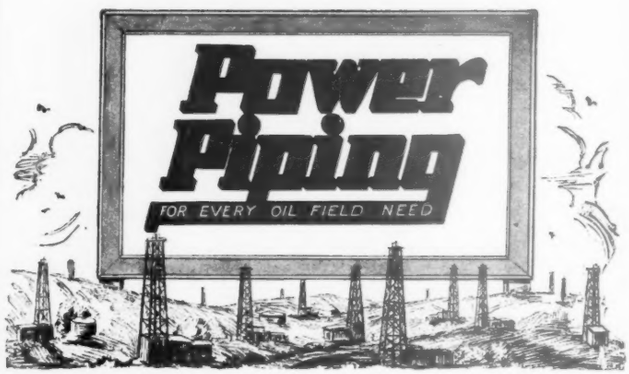

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not enough to destroy the relationship. Well "F" is out of line not only in pressure, but in other characteristics, due to the fact, probably, that it was shot immediately after completion and natural flow conditions were thereby destroyed.

Specific Gravity of Gas

The relationship between gas-gravity and the more efficient wells in shown on Plate 3-X, in which the average gas gravity for each well under Test 1 is plotted against the Test 1 gas-oil ratio. There is clearly a definite relationship where rich gas (high gravity) accompanies low gas-oil ratios, and the gravity decreases as the per cent gas-oil ratios increase. A similar relation exists between "average gas gravities" (Table 3, column 3) of all the tests and "per cent gas-oil ratios." So far as Salt Creek wells were concerned, the wells which could be controlled and made to yield reduced gas-oil ratios were those bearing rich gas of high gasoline content. In other words, the gas gravity varies inversely with the gas-oil ratios; that is, rich gas accompanies low ratios and lean gas accompanies righ ratios. Further analysis shows that the low-gravity gas was usually found in wells producing large quantities of gas. This was probably due to the fact that the lighter fractions in the gas were derived almost entirely from the oil. It is reasonable, therefore, to suppose that the larger the volume of gas, the less saturated it would be, in as much as there is only a definite quantity of lighter fractions in the oil. All of the above discussion indicates that usually large gassers are inefficient wells; although exceptions may be found.

These relations should be noticed and checked, if possible, in other fields, as they are of value for identification in studying the flow-control problems.

Structural Position

Evidence gathered from approximately 100 Second sand wells in the Salt Creek Field showed that wells located low on the structure had lower gas-oil ratios than those located higher, due undoubtedly to the gas in the oil having the tendency to segregate and migrate toward the top of the structure. This was definitely proved when the field had declined to a pumping stage. At this time wells on top of the structure began to produce increased quantities of free gas; a situation which very seldom prevailed during the earlier life of the field.

TABLE 3
WELLS LISTED IN THE ORDER OF THEIR EFFICIENCIES IN RESPONSE TO FLOW CONTROL, SHOWING THEIR NATURAL CHARACTERISTICS

Column	1	2	3	4	5	6	7
Well	Avrg. Pct. Gas-Oil Ratio in Valve and Nipple Tests	Open-Flow Gas Volume	Specific Gravity of Gas Open-Flow	Open-Flow Pressure	Closed-in Pressure	Hours to Maximum Pressure After Closing-In	Initial Production
"G"	76.40	240,750	1.020	11	450†		490
"E"	89.88	207,250	.990	41	495	15	464*
"D"	102.5	1,052,000	.880	72	515	7	1,025
"A"	105.58	1,141,000	.777	29	540	4	738
"C"	110.10	317,000	.913	43†	540	30	750
"B"	151.32	384,000	.976	17	500	6	372
"F"	153.60	228,666	.931	32	460	20	430*

Column	8	9	10	11	12	13	14	15	16
Well	Oil Production	Open-Flow Gas-Oil* Ratio	Depth of Well	Elevation Sand Above Sea Level	Thickness of Sand	Size of Casing	Length of Flow Line	Age of Well Mo. & Da.	Decline of Oil Bbl. per Month
"G"	480	502	2,193	2,798	58	6⅝	450	8-23	1.1
"E"	262	572	1,907	3,083	55	6⅝	900	4-25	2.0
"D"	1,031	1,020	1,917	3,025	67	6⅝	900	7- 5	16.0
"A"	538	2,120	2,050	2,875	65	8¼	300	23-10	8.3
"C"	347	912	1,827	3,128	77	6⅝	825	27-26	14.4
"B"	178	2,157	1,998	2,884	64	8¼	942	16-22	11.4
"F"	378	605	1,901	3,092	65	8¼	1,225	5- 4	10.4

*Well shot. †Estimated.

A curve prepared from data pertaining to the 100 Second sand wells shows that where the sand is structurally 2,300 feet above sea level, the wells produced an average of 900 cubic feet of gas per barrel of oil. Those located 3,500 feet above sea level yielded an average gas-oil ratio of 4,000 cubic feet per barrel; an increase of about 500 cubic feet for every structural rise of 200 feet.

All of the test wells were below the average established by the 100 wells, and the relation is not so pronounced, although well "G" which was the most efficient, is lowest structurally (Table 3, col 11). In general, wells lower on the structure with lower gas-oil ratios gave more response to control.

Thickness of Sand

The data show that the two most efficient wells, "G" and "E," were producing from a smaller thickness of sand than were the others. (Table 3, col. 12.) Sufficient information is not available to show whether this is only a coincidence, or whether the relation might hold true generally. It is logical to assume, however, that with a given amount of oil and gas, better efficiency of flow might be secured in a thin sand than in a thicker one, in as much as there would be less room for gas to by-pass without bringing oil with it.

Age of Wells

Evidence indicates that with the exception of well "F," the youngest wells were the most efficient and gave more reductions of gas-oil ratio than the older wells. Well "F" is probably out of line again, due to a shot after completion, in as much as its age places it in position with "E," the offset well. (Table 3, col. 15.) Well "E" was also shot, but subsurface conditions apparently were not altered sufficiently to change its natural performance. It is logical that the age of a well has a bearing on its efficiency. As the sand becomes drained of oil there is a greater chance of by-passing of gas through the sand pores without bringing its former quota of oil. This of course would result in increased gas-oil ratios.

Rate of Decline

The rate of decline in oil production seems to bear a relation to the efficiency of a well. Data show that wells "G" and "E," which gave the best results, had a very small decline of 1 and 2 bbls. of oil per month, respectively. The others declined between 8 and 16 bbls. per month for the period of testing (Table 3, col. 16).

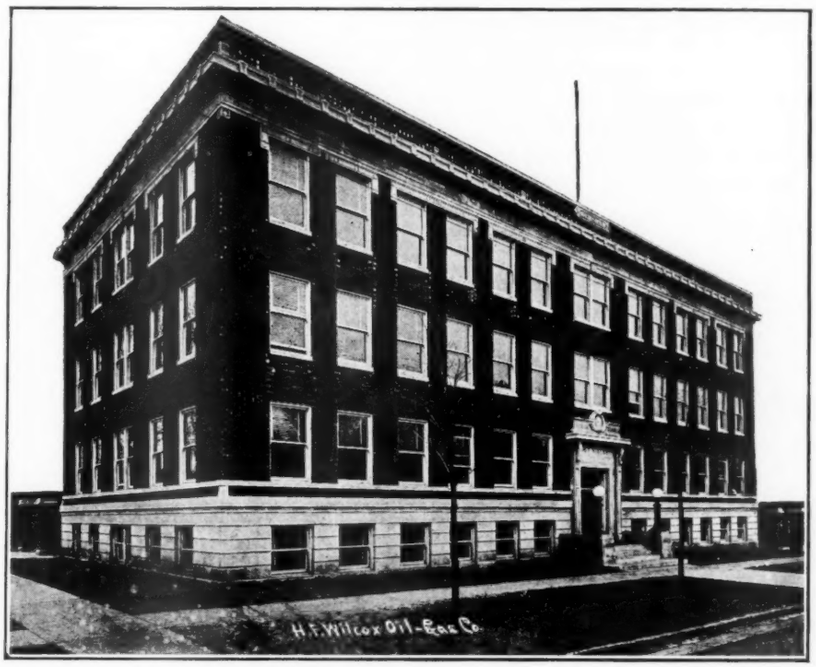
Size of Casing

Although "G" and "E" both flowed through 6⅝-inch casing while most of the inefficient wells were produced through 8¼-inch casing, (Table 3, col. 13), there is some hesitancy in saying that this factor was of very great importance in the behavior of these particular wells. The use of smaller sized casing, however, will undoubtedly establish greater efficiency in flow conditions in a well, in the same way that the use of tubing yielded good results.

The seven natural characteristics of wells, just discussed, seem to constitute all of the important ones by which wells typical of the Salt Creek Field could possibly be recognized as potential yielders of reduced gas-oil ratios under control. Obviously, the practical value of well control is in being able to reduce the gas-oil ratio below the ratio existing when flowing through casing without the expenditure of time and money in determining the type of well which can be worked with. The facts brought out in the Salt Creek tests may not be wholly applicable to other fields; but the writer believes that some of them will. If so, it would seem that some definite rules for controlling wells have been established.

Well Connections and Flow Lines

It was evident, after the tests were brought to a conclusion in the early summer of 1923, that the type of well connections and location of the well might have had something to do with



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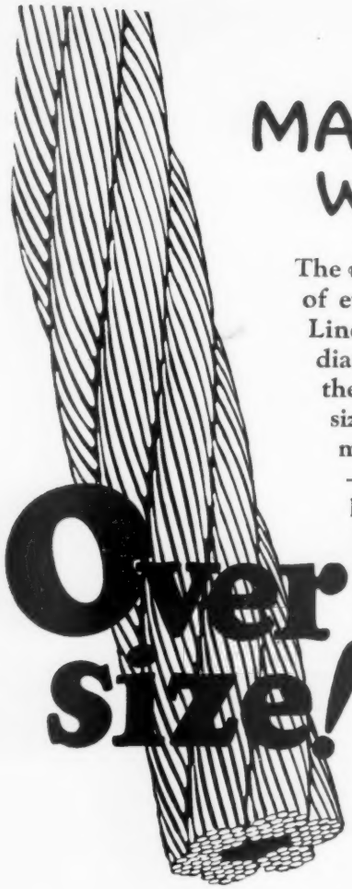

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the efficiency of flow. The writer suggested that the location of well "B" at the foot of a hill might account for some of its inefficiency. This was because its flow line led over the top of a hill, 27 feet above the well head, and then extended for a distance of 942 feet to the base of a gas trap stand, where it rose vertically 30 feet to the gas trap. The flow of oil before entering the flow line also had to go through either four or eight right-angle turns at the well head, depending upon whether tubing was in the well or not. The oil inlet to the trap was 42½ feet above the well. Adding the friction in the connections and flow line to the static pressure created by oil in the line, well "B" always had to flow against a maximum head of 16.3 pounds per square inch; assuming that the flow line was fairly well filled with oil all of the time. A smaller head would be effective if the line was not full.

Recommendations were made in June, 1923, for a test to be performed on "B" with the flow tank placed adjacent to the well. It was suggested that the flow line consist of a flanged "goose-neck" pipe leading from the well to the tank. This was not carried out at the time, but several months later, tanks were moved adjacent to other wells in the field with astounding results in increased oil production. Later the amount of oil was further increased by enlarging the diameter of the flow line from 3 and 4 inches to 6 inches and only one or two joints of pipe from the well to the tank were used. No data are available as to how the gas-oil ratio was affected.

It is recommended that where possible flow tanks and gas traps be moved close to a well and the well produced through a large diameter flow line bent in the shape of a "goose-neck" to eliminate right-angle turns. This will save the cost of long flow lines, and probably the production will be increased.

All of the gas in four of the test wells was allowed to flow through lines under atmospheric pressure after being metered. In the other four, the gas lines were connected to a "booster" or vacuum system, used for bringing gas into gasoline plants, where a few ounces of vacuum was maintained. This pull was never strong enough to extend to the well head except in one or two instances on the same well. At this time tests were made with the vacuum on and off the trap. At no time was there a difference in pressure noted at the well head. This indicated that any possible vacuum was too small to be recorded on the pressure gauges; although there is no doubt that frequently the vacuum was strong enough to remove a few ounces of back pressure which might have existed in the gas trap. Removal of trap pressure was tried in Test 15a on well "A," discussed previously. The wells with their traps connected to the "booster" system were "D," "C," "E," and "F."

Influence of Atmospheric Temperature

Data indicated that in some tests the low temperature of the atmosphere in the fall and winter months caused a portion of the oil to congeal in the flow line. The resultant back pressure cut down the daily production and increased gas-oil ratios. This will especially be true in long lines carrying oil having a fairly high pour test. Fields in the Rocky Mountain region would experience this more perhaps than in other oil-producing districts. This fact suggests that shortening flow lines and burying them underneath the surface of the ground might give better efficiency.

Inefficient wells are subject to this effect from cold atmosphere more than the others, because it was found that the temperature of the oil at the well head was always lower where high gas-oil ratios existed. This would give the oil an initial cooling, which, together with low atmospheric temperatures, would cause temporary increased viscosity and partial clogging of the flow line.

Increase in Ratios with Age of Field

Available records show that gas-oil ratios from the Second Wall Creek sand in the Salt Creek Field increased steadily from approximately 650 cubic feet per barrel in January, 1922, to 2,950 cubic feet per barrel in July, 1925, when only 7 per cent of the Second sand wells were still flowing. By December, 1925, when the next gas-oil survey was made by the Midwest Refining Co., the ratio had dropped preceptibly to about 1,780 for Second sand wells. The field was then in the pumping stage and only one-half of 1 per cent of the total number of Second sand wells were flowing. Between January, 1922, and July, 1925, the closed-in pressure of the Second sand dropped from about 500 pounds to 85 pounds per square inch. It is interesting to note that the initial boiling point of Second sand oil was increased perceptibly with the decline in pressure. In 1922, it averaged about 98 to 103 degrees Fahrenheit; 116 degrees in 1924; and 142 to 145 degrees in July, 1926.

Increase in Ratios as Oil Declines

An observation of the daily results in most of the tests shows that there was always the tendency for a well to gradually become more inefficient through an increase in its gas-oil ratio even, in each test, no matter what type of test was in progress. Of course, this is the logical result if the gas-oil ratio of a whole field increases with age. In the wells flowing under comparatively small gas-oil ratios, however, this tendency was not so marked, although it was frequently noticed. The increase in ratio is attributed to the decline in oil with a proportionately less rapid decline in gas production.

Increase in Gas Volume

In well "B," throughout the entire test period it was frequently noted that some tests gave gas volumes considerably in excess of the amount produced in Test 1 when the well flowed wide open through casing. At such times the orifice meters were checked and all gas calculations were reviewed, in order to determine possible errors, but no mistakes were found. This proved that there was an actual increase in the amount of gas issuing from the well. This characteristic was found at a later date, in wells higher on the structure, but not in those as low structurally as well "B." The writer now believes that drainage conditions in the sand within the productive radius of this well were such that in certain tests where the amount of available oil was small a portion of the sand—perhaps the upper part—was barren of fluid and permitted increasing amounts of gas to enter the well without bringing oil with it.

Increase in gas volume is certainly not desired when there is no corresponding increase in oil production, and in wells which have a streak in the sand barren of oil but producing gas, it might even be advisable to seal this zone off by cementing or by the use of a packer.

In some districts operators connect a gas orifice meter to the gas line leading from the trap during the time a well is being drilled into the sand. Increases in gas volume are recorded. After the sand is drilled, the chart on the meter is correlated with the log, and in this way an accurate record may be obtained as to the location of any possible "gas streaks" in the sand. This method is suggested by Millikan[10], of the Amerada Petroleum Corp. Information given by such records might be of inestimable value in controlling a well or in determining the proper depths for setting tubing.

Flow Velocities and Head Flows

No work on the study of well efficiencies and methods of producing flowing wells to secure increased efficiencies is complete without making mention of certain other factors and conditions which play a major part. Reference is made particularly to velocity of flow, pressure changes, continuous or steady flow, and head flow.

It was realized from the beginning of the experimental work that perhaps the explanation of well performance might lie in the proper solution of "flow velocities." A great deal of time and study has been given to this subject and it is not yet concluded. The writer believes that there is such a thing as "critical velocity" in flowing wells, where certain velocity ratios of gas and oil allow by-

[10]Millikan, C. V., "Use of Gas Meters for Determination of Pay Strata in Oil Sands": A. I. M. E., "Petroleum Development and Technology in 1925," pp 183-195.

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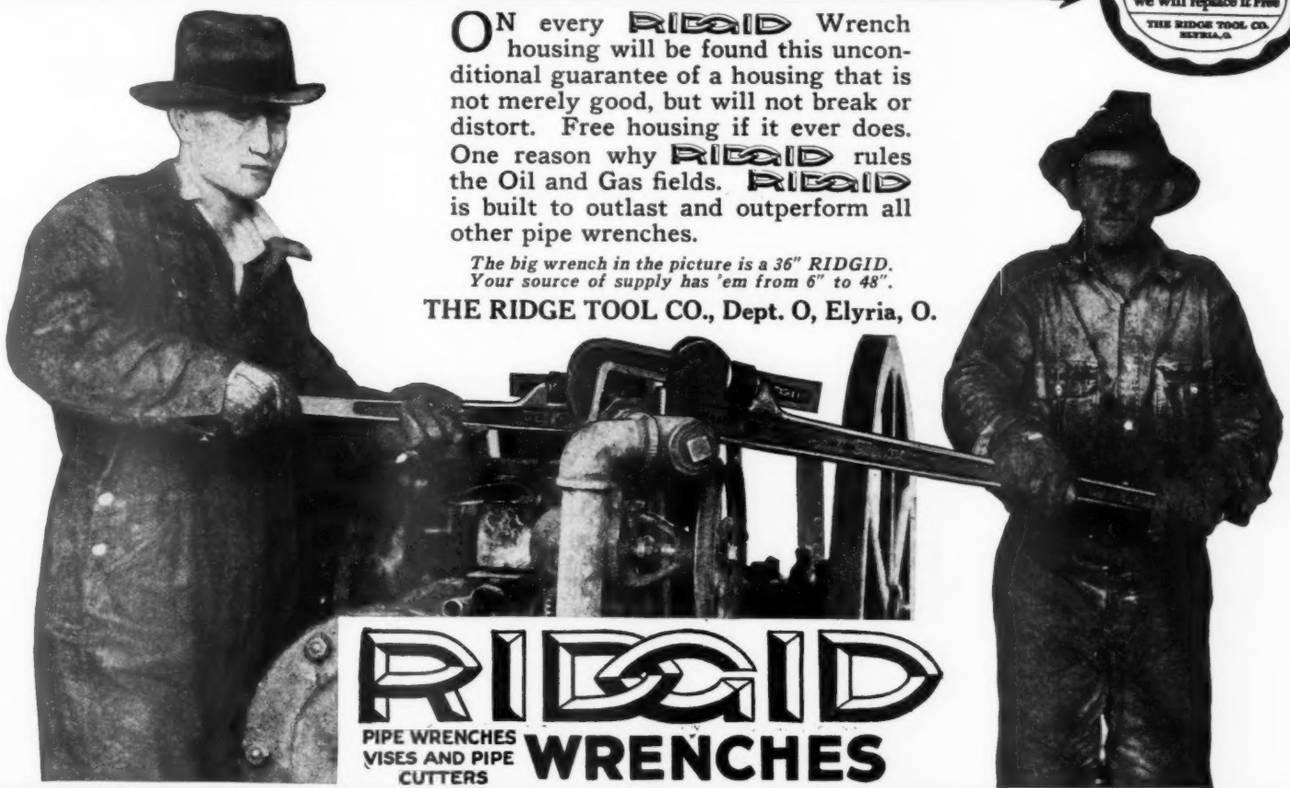

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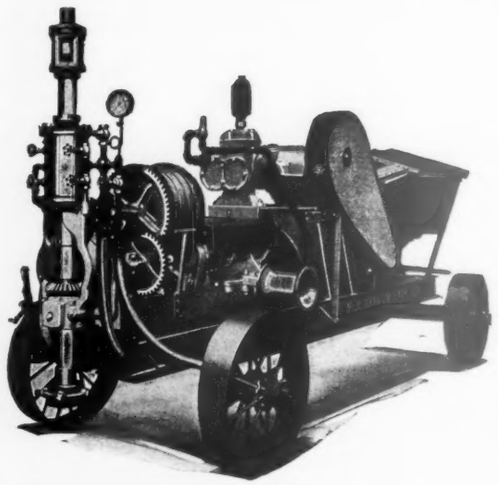

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passing of gas with increased gas-oil ratios.

Gas velocity is computed easily, using the formula: $q = \frac{.7854d^2}{144} \times 3600\ V$,

where q = quantity of gas passing through pipe in cubic feet per hour.

$\frac{0.7854d^2}{144}$ = area of pipe in square feet.

d = diameter of pipe in inches.

144 = number square inches in one square foot.

3600 = seconds per hour.

V = velocity in feet per second.

$q = \frac{.7854^2}{144} \times 3600\ V = 19.64d^2 \times V.$

$V = \frac{q}{19.64d^2}$

Before using the formula, however, the volume of gas must be converted into the actual volume in the casing under whatever back pressure exists. This may be done through the use of the formula:

$$V_2 = \frac{P_1V_1}{P_2}$$

This conversion is necessary, due to the fact that the effective velocity of flow is within the casing where the oil and gas is being brought to the surface, and the volume under pressure is considerably different than that at atmosphere. Allowance should also be made for solubility.

The velocities of the gas for each test in every well have been calculated but are not included in this report, as there is no clear cut relation between them and the well efficiencies; particularly in casing flow. With tubing flow, however, efficiency generally decreases as the velocity increases.

Velocities of oil are naturally related to those of gas, but cannot be readily calculated without experimental data from which formulas can be developed. If oil always issued from a well as a mist, it would have practically the same velocity as the gas and there would be no by-passing. However, the conditions of flow are different in each well and under every method of producing.

The test wells in the Salt Creek Field showed these different conditions. Some tests caused the wells to flow steadily; others to flow by heads or cycles. Again they flowed with such amounts of excess gas that most of the oil was in mist form. Even when flowing steadily, the volume of oil per day was never sufficient to indicate that the casing or tubing was filled with a solid stream of oil, and therefore there was opportunity for by-passing, which means that the gas and oil traveled upward at different velocities. In flowing by heads or cycles, the oil would travel in slugs separated by gas pockets. Probably the gas did very little work in lifting the oil. Head flows came at regularly timed intervals.

Observations were made on several of the wells, and data were secured on head flows. In Well "F", when an attempt was being made to "pinch" the well to 50 per cent flow, it was observed that the well would flow oil for one and one-half minutes and then "gas" freely for two minutes. During the oil period of one and one-half minutes, the pressure would gradually increase from 112 pounds at the beginning, to a maximum of 150 pounds at the end of the period. As the gas period started, the pressure would begin to decline and drop to 112 pounds again, when another oil period would start. The regularity of "head flows" was very consistent.

Obviously, the velocity of the gas during the gas period is different than that of the oil during the oil period. In computing oil velocities, the available hydraulic formulas are useless, because they are usually based on continuous flowing volumes of liquid, which completely fill the horizontal pipe with either "turbulent" or "stream line" flow, under more or less constant pressures.

In an oil well, the casing is vertical; it is seldom flowing completely filled with fluid; there may be fluctuating pressures; and the oil contains gas in solution which is constantly expanding. Velocities of oil computed with available formulas are ridiculously low and impossible.

In Well "F" mentioned above, there were two minutes out of every three and one-half when gas only was flowing to the trap. The fact that this gas occurs at the casinghead in free pockets indicates that it has been segregated between oil slugs. This gas may have done some work in bringing the oil into the hole and starting it on its upward journey, but it is less effective as a lifting agent than the gas that is mingled with the oil in the slugs.

By noting the cycles of oil and gas flow in Well "F" under 50 per cent flow and computing the fraction of the gas that was doing the work, it was found that oil was flowing only 10.3 hours out of every 24 hours. During the remainder of the day, free gas was escaping. In Well "A", Test 5a, the gas-oil ratio could have been cut to 1,225 cubic feet per barrel, or one-half the actual figure, if some method could have been evolved to eliminate a two-minute period of "gassing" out of every four minutes.

Later Production of Test Wells

It is interesting to note the daily production of all the test wells in June, 1926, three years after the conclusion of the test work and after all of the wells were on the pump. In order of largest daily production, they are listed as follows:

	Bbls.
"H"	165
"G"	31
"A"	27
"C"	19
"E"	18
"F"	6
"B"	5
"D"	4

Well "H" had been shot since it was placed on the pump, which accounts for the abnormal amount of oil; but making allowances for this, it would have a comparatively high production. The wells which gave the greatest response to control and yielded reduced gas-oil ratios are at the top of the list with greater oil production. (Well "A" is an exception). Of course, this is not due to the test control work which was done three years previous, but it does seem to indicate that those wells which through natural conditions had fairly efficient flow and low gas-oil ratios are now capable of yielding the most oil. Might not this help to substantiate the theory that if the gas-oil ratios can be reduced to a minimum, greater ultimate recovery will result?—Reports of Investigation, Bureau of Mines, Department of Commerce.

Acknowledgments

Special credit should be given A. W. Peake, general superintendent; E. L. Estabrook, formerly petroleum production engineer, and Fred E. Woods, petroleum engineer of the Midwest Refining Co., for their helpful co-operation and advice. E. V. Foran and E. Buddruss, formerly of that company, had charge of the gas measurement and gas testing during the experiments.

R. Van A. Mills, petroleum engineer, Bureau of Mines, participated in the work from September to December, 1922, and for two weeks during April, 1923, and gave valuable assistance by evolving many of the steps carried out in the work.

R. E. Heithecker, junior engineer, Bureau of Mines, assisted in compiling data used in the manuscript. R. Van A. Mills, R. R. Brandenthaler and H. C. Miller, H. C. Fowler, petroleum engineers of the Bureau of Miles, contributed constructive criticisms and suggestions.

Appendix

Locations, logs, and other data pertaining to test wells in the Salt Creek Field:

Well "A"

Well No. 16-A, NW Section 13.

Log

Company: The Midwest Refining Co.

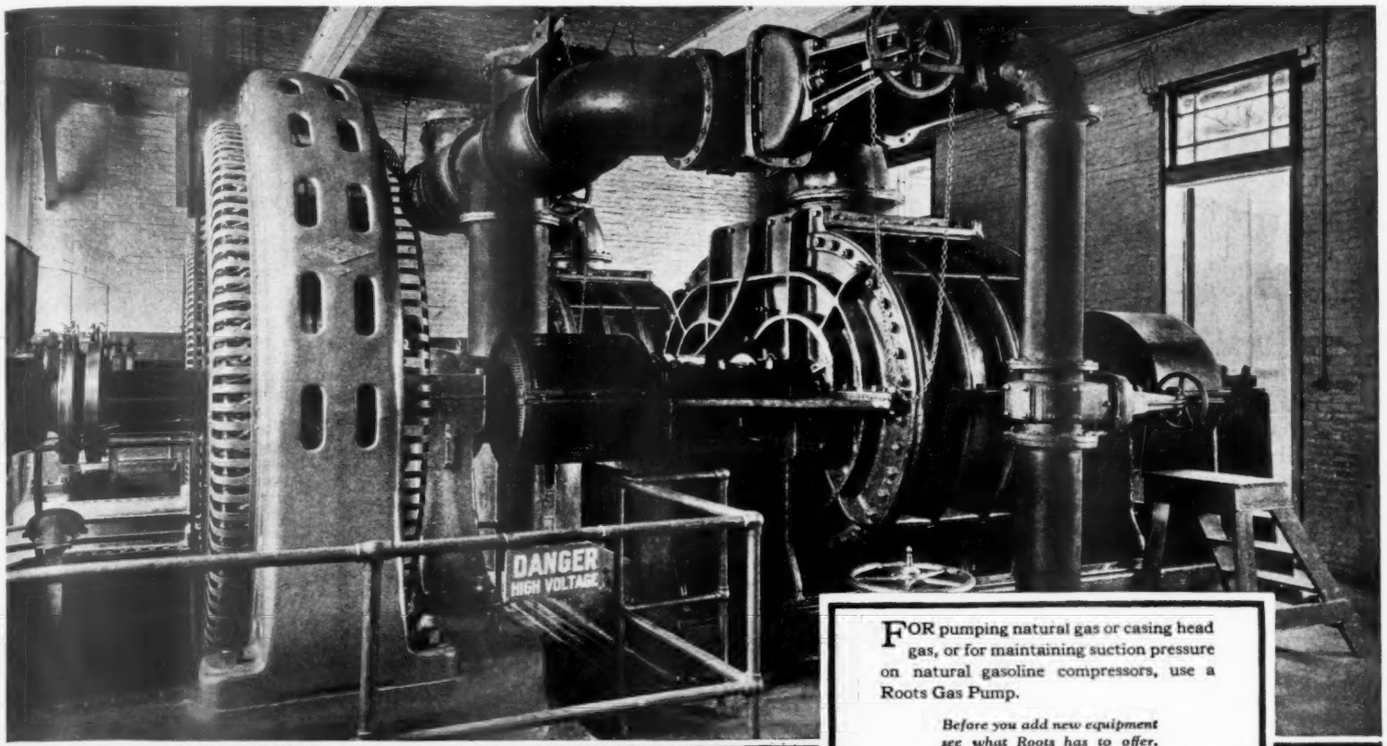
Location: 1,100 feet south of north line and 1,100 feet east of west line, NW Section 13-40n-79w.

Elevation: 4,845 feet.

Commenced: June 11, 1920; finished August 25, 1920.

Casing record: 12½ inch, 45-pound, 10-thread, 62 feet; 10-inch, 40-pound, 10-thread, 1,586 feet, 305 feet pulled; 8¼-inch, 28-pound, 10-thread, 1,715 feet.

Cementing record: 12½-inch, set at 70 feet, cemented with 10 sacks; 8¼-



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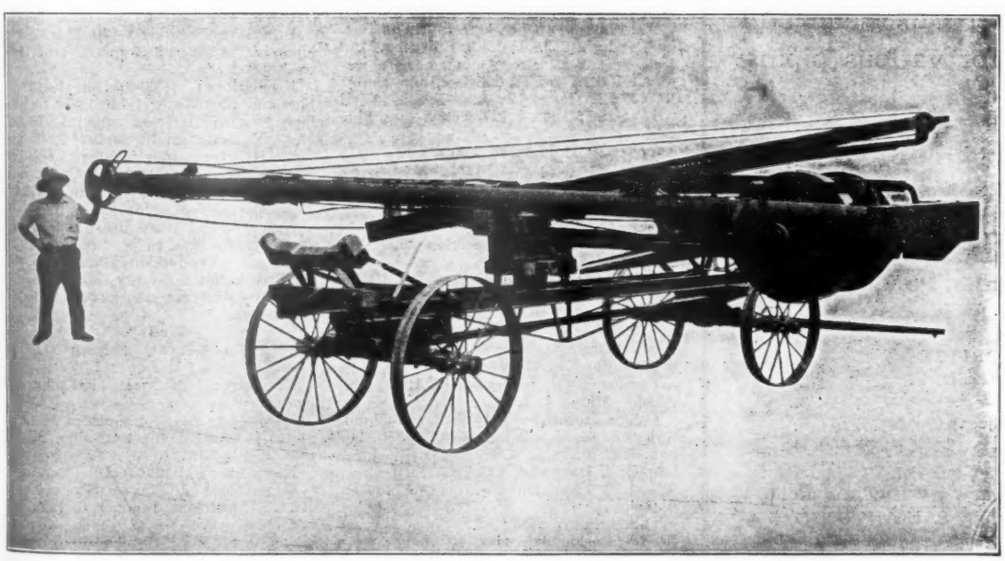

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inch, set at 1,715 feet, cemented with 50 sacks.

Initial production: 738 bbls. per 24 hours.

Formations: 0-1,586 feet, 1,586 feet, gray and blue shale; 1,586-1686 feet, 100 feet, first Wall Creek sand, (contains a small amount of water); 1,686-1,970 feet, 284 feet, blue shale; 1,970-2,035 feet, 65 feet, second Wall Creek sand; 2,035-2,050 feet, 15 feet, shale.

Production Data

Five hundred thirty eight barrels oil, 1,141,000 cubic feet gas, gas-oil ratio, 2,120 cubic feet.

Well "B"

Well No. 8-A, NW Section 13.

Log

Company: The Midwest Refining Co.

Location: 620 feet south of north line and 623 feet east of west line, NW Section 13-40n-79w.

Elevation: 4,818 feet.

Commenced: September 2, 1920; finished March 14, 1921.

Casing record: 12½-inch, 45-pound, 10-thread, 78 feet, 2-inch; 8¼-inch, 28-pound, 10-thread, 1,672 feet; 6⅝-inch, 24-pound, 10-thread, 1,957 feet (probably 1,932 feet), threads off measurement.

Cementing record: 12½-inch, set at 80 feet, cemented with 10 sacks; 8¼-inch, set at 1,680 feet, cemented with 50 sacks.

Initial production: 372 bbls. per 24 hours.

Formations: 0-1,558 feet, 1,558 feet, blue and gray shale; 1,558-1,650 feet, 92 feet, first Wall Creek sand, contains some water, with little or no oil; 1,650-1,934 feet, 284 feet, blue shale; 1,934-1,998 feet, 64 feet, second Wall Creek sand.

Production Data

One hundred seventy eight barrels oil, 384,000 cubic feet gas; gas-oil ratio, 2,157 cubic feet.

Well "C"

Well No. 34-A, SE Section 25.

Log

Company: Wyoming Associated-Midwest Refining Co.

Location: 133 feet south of north line and 1,113 feet west of east line, SE Section 25-40n-79w.

Elevation: 4,873.3 feet.

Commenced: February 20, 1918. Completed: April 19, 1920. (Second drilling, April 30, 1920).

Casing record: 15½-inch, 59 feet; 10-inch, 1,360 feet, all pulled; 8¼-inch, 1,513 feet; 6⅝-inch, 1,745 feet.

Cementing record: 8¼-inch, set at 1,513 feet, cemented with 50 sacks.

Initial production: 750 bbls. per 24 hours.

Formations: 0-1,360 feet, 1,350 feet, blue and gray shale; 1,360-1,500 feet, 140 feet, first Wall Creek sand, carries water; 1,500-1,745 feet, 245 feet, blue shale; 1,745-1,822 feet, 77 feet, second Wall Creek sand; 1,822-1,727 feet, 5 feet, blue shale.

Production Data

Three hundred forty seven barrels oil, 317,000 cubic feet gas, gas-oil ratio, 912 cubic feet.

Well "D"

Well No. 31-A, SW Section 30.

Log

Company: Wyoming Associated-Midwest Refining Co.

Location: 220 feet north of south line and 220 feet east of west line, SW Section 30-40n-78w.

Elevation: 4,861.3 feet.

Commenced: September 13, 1921. Finished: March 1, 1922.

Casing record: 12½-inch, 45-pound, 8-thread, 84 feet, 2 inches; 6⅝-inch, 20-pound, 10-thread, 1,800 feet; 8¼-inch, 28-pound, 10-thread, 1,637 feet, 2 inches; 5⅞-inch, 17-pound, 10-thread, 112 feet, 9 inches.

Cementing record: 12½-inch, set at 88 feet, cemented with 10 sacks; 8¼-inch, set at 1,638 feet, cemented with 50 sacks; 6⅝-inch, set at 1,800 feet, cemented with 50 sacks.

Initial production: 1,025 bbls. per 24 hours.

Formations: 0-1,462 feet, 1,462 feet, blue shale, light show of oil at 575 feet, 870 feet and 940 feet; 1,462-1,595 feet, 133 feet, first Wall Creek sand, struck first water at 1,510 feet making 100 bbls. of water per day; 1,595-1,603 feet, 8 feet, blue shale; 1,603-1,607 feet, 4 feet, water sand, 1,200 feet of water and 150 feet of oil now in hole; 1,607-1,800 feet, 193 feet, blue shale; 1,800-1,836 feet, 36 feet, blue shale; 1,836-1,903 feet, 67 feet, second Wall Creek sand, hard; 1,903-1,917 feet, 14 feet, blue shale.

Production Data

One thousand thirty-one barrels oil, 1,052,000 cubic feet gas, gas-oil ratio, 1,020 cubic feet.

Well "E"

Well No. 31-A, NW Section 1.

Log

Company: Wyoming Associated-Midwest Refining Co., operators.

Location: 222 feet north of south line and 223 feet east of west line, NW Section 1-39n-79w.

Elevation: 4,915 feet.

Commenced drilling: April 2, 1921. Finished: May 2, 1922.

Casing record: 12½-inch, 36-pound, 11½-thread, 56 feet, 9 inches; 8¼-inch, 28-pound, 10-thread, 1,620 feet; 6⅝-inch, 20-pound, 10-thread, 1,815 feet; 5⅞-inch, 17-pound, 11½-thread, 70 feet, 4 inches. (Liner set on second sand).

Cementing record: 8½-inch, set at 1,620 feet, 50 sacks of cement; 12½-inch, set at 60 feet, 10 sacks of cement; 6⅝-inch, set at 1,815 feet, 50 sacks of cement.

Initial production: 464 bbls. per 24 hours; after shot of 20 quarts from 1,877 to 1,887 feet.

Formations: 0-1,445 feet, 1,445 feet, blue and gray shale, show of oil at 930 feet; 1,445-1,585 feet, 140 feet, first Wall Creek sand; 1,585-1,832 feet, 247 feet, shale; 1,832-1,887 feet, 55 feet, second Wall Creek sand, flowed a small amount before shot; 1,877-1,907 feet, 20 feet, bentonite and shale.

Production Data

Three hundred sixty two barrels oil, 207,250 cubic feet gas, gas-oil ratio, 572 cubic feet.

Well "F"

Well No. 36-A, NE Section 2.

Log

Company: Wyoming Associated-Midwest Refining Co., operators.

Location: 201 feet north of south line and 201 feet west of east line, NE Section 2-39n-79w.

Elevation: 4,922 feet.

Commenced drilling: December 18, 1921. Finished: April 24, 1922.

Casing record: 12½-inch, 45-pound, 10-thread, 78 feet, 5 inches; 10-inch, 45-pound, 10 thread, 614 feet; 8¼-inch, 28-pound, 10-thread, 1,665 feet; 6⅝-inch, 20-pound, 10-thread, 175 feet.

Cementing record: 12½-inch, set at 81 feet; 8¼-inch, set at 1,665 feet.

Initial production: 430 bbls. per 24 hours, after shot of 40 quarts from 1,860 to 1,880 feet.

Formations: 0-1,440 feet, 1,440 feet, blue and gray shale; 1,440-1,570 feet, 130 feet, first Wall Creek sand; 1,570-1,665 feet, 95 feet, sandy shale; 1,665-1,830 feet, 165 feet, blue shale; 1,830-1,895 feet, 65 feet, second Wall Creek sand; 1,895-1,900 feet, 5 feet, bentonite; 1,900-1905 feet, 5 feet, blue shale.

Note: Steel lime measurement after shot shows depth to be 1,901 feet.

Production Data

Three hundred seventy-eight barrels oil; 228,666 cubic feet gas, gas-oil ratio, 605 cubic feet.

Well "G"

Well No. 6-A SE, Section 27.

Log

Company: Midwest Refining Co., operators.

Location: 223 feet south of north line and 223 feet east of west line, SE Section 27-40n-79w.

Elevation: 4,919.8 feet.

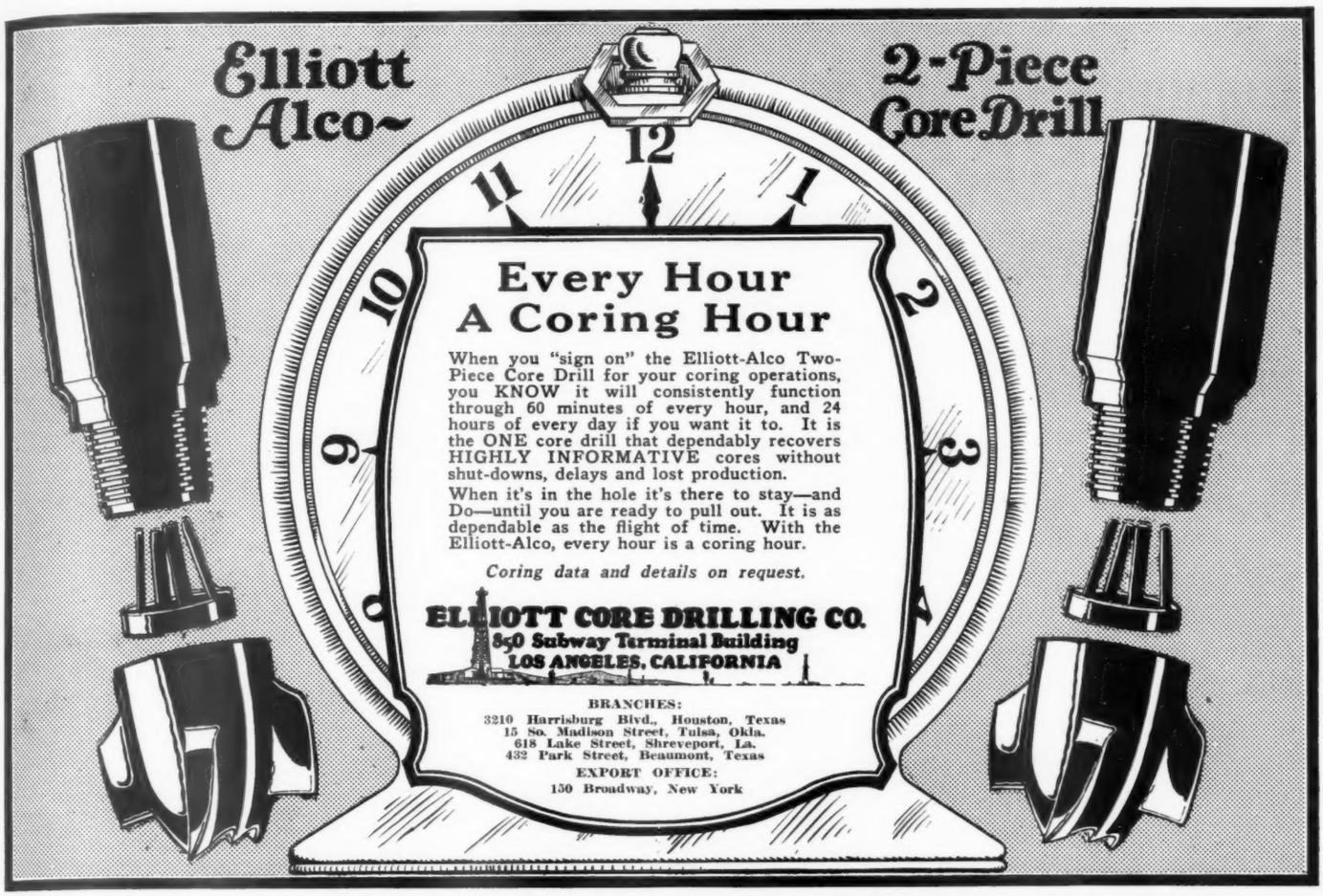
Commenced drilling: September 16, 1921. Finished: January 6, 1922.

Casing record: 12½-inch, 40-pound, 8-thread, 89 feet; 10-inch, 40 pound, 10-thread, 1,185 feet; 8¼-inch, 28-pound, 10-thread, 1,873 feet; 6⅝-inch, 20 pound, 10 thread, 2,123 feet.

Cementing record: 12½-inch, set at 94 feet, 9 inches, cemented with 10 sacks; 8¼-inch, set at 1,875 feet, cemented with 50 sacks.

Initial production: 490 bbls. per 24 hours.

Formations: 0-1,195 feet, 1,195 feet,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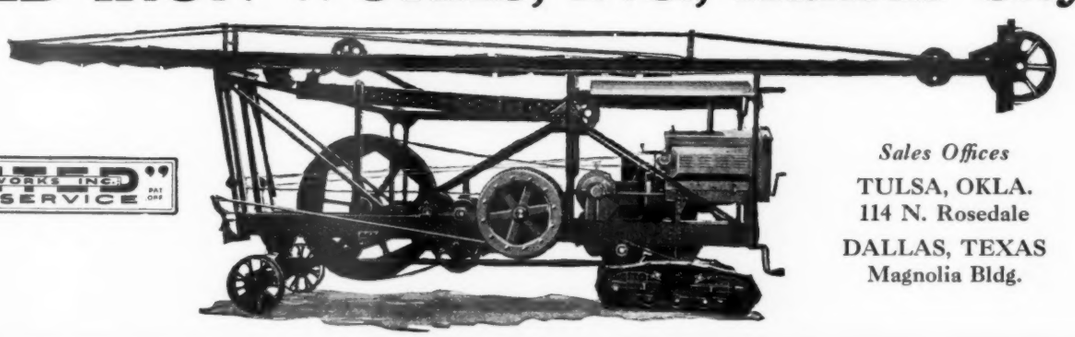

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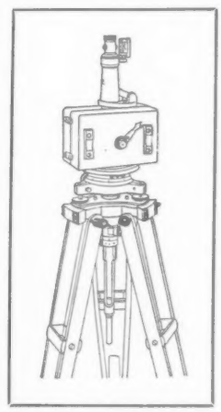

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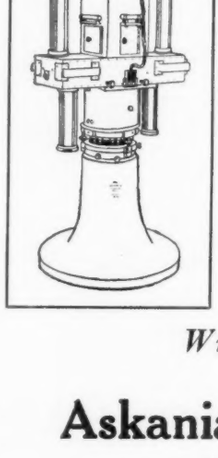

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blue shale; 1,195-1,705 feet, 510 feet, blue shale; 1,705-1,831 feet, 126 feet, first Wall Creek sand, 1,500 feet of water in hole; 1,831-1,875 feet, 44 feet, blue shale; 1,875-1,895 feet, 20 feet sandy shale; 1,895-1,925 feet, 30 feet, blue shale; 1,925-2,122 feet, 197 feet, blue and gray shale; 2,122-2,183 feet, 61 feet, second Wall Creek sand; 2,183-2,193 feet, 10 feet, gray shale.

Production Data

Four hundred eigthy barrels oil, 240,750 cubic feet gas, gas-oil ratio, 502 feet.

Well "H"

Well No. 30-A, NE Section 27.

Log

Company: Wyoming Associated-Midwest Refining Co., operators.

Location: 657 feet north of south line and 220 feet east of west line, NE Section 27-40n-27w.

Elevation: 4,907.6 feet.

Commenced drilling: December 27, 1921. Finished: June 3, 1922.

Casing record: 15½-inch, 52½-pound, 11½-thread, 76 feet, 7 inches; 10-inch, 45-pound, 10-thread, 1,237 feet, 8 inches; 8¼-inch, 28-pound, 10-thread, 1,940 feet, 8 inches; 6⅝-inch, 20-pound, 10-thread, 225 feet (liner); set on second sand.

Cementing record: 15½-inch, 81 feet, 10 sacks; 8¼-inch, 1,941 feet, 60 sacks.

Initial production: 435 bbls. per 24 hours.

Formations: 0-215 feet, blue and gray shale; 215-285 feet, 70 feet, sandy blue shale; 285-1,716 feet, 1,431 feet, blue shale; 1,716-1,842 feet, 126 feet, first Wall Creek sand; 1,842-2,129 feet, 287 feet, blue shale; 2,129-2,190 feet, 61 feet, second Wall Creek sand; 2,190-2,206 feet, 16 feet, shale.

Production Data

Two hundred forty five barrels oil, 116,000 cubic feet gas, gas-oil ratio, 474 cubic feet.

OIL FROM COAL OFFERS CANADA LITTLE HOPE

By Victor Lauriston

CHATHAM, Ontario, Nov. 26.—That the commercial production of oil from the immense Canadian coal deposits is not an immediate possibility is indicated by investigations carried on by Charles Stewart, minister of mines in the Federal government.

The problem of the low temperature carbonization of coal as applied to the Maritime Provinces, Ontario, Saskatchewan and Alberta, is being studied by Mr. Stewart, who recently returned from Europe. Accompanied by his deputy, Doctor Camsell, the minister visited a number of plants in the United Kingdom and in Germany. In Germany, low temperature plants were examined at Essen, Mulheim, Leopold and Minna Anna, and a visit made to the liquefaction works being erected by the I. G. Farben Industrie, at Leuna, near Halle.

In Great Britain, an itinerary was worked out for Mr. Stewart by the British fuel research board covering the more important developments in low temperature carbonization in that country. In addition, conferences were held with a number of other organizations and individuals developing low temperature methods, of which there is record of about 200 different patents in Great Britain alone.

In connection with the investigation Mr. Stewart makes the following statement:

"The conclusion reached with regard to the present status of low temperature carbonization is first of all that extraordinary interest is being shown in developing processes, particularly in Great Britain and Germany, where in one case the production of a smokeless fuel is the great desideratum, and in the other the maximum yield of oils and other by-products from the coal; secondly, that while rapid progress is being made in the development of methods of carbonization, no single one of these methods can yet be said to have been thoroughly proven to be commercially successful on a large scale with the exception of a process which has been in operation in Germany on brown coals for several years and is used mainly for the production of wax.

"In addition, it is unlikely that any one system will ever be adopted as applicable to all coals and all conditions to the exclusion of all other systems. It is certain that the type of plant to be adopted in any particular case will depend on the object aimed at and the quality of the coal available. In other words, the problem of low temperature carbonization as applied to the Maritime provinces will be different from that of Ontario, and also from those of Saskatchewan and Alberta, owing to the different types of coal available and the different market conditions prevailing in each place.

"As a result of these visits, valuable information was gained and connections made that will permit officers of the department to keep in close touch with the progress of development, so that advantage may be taken of them if these developments should prove applicable to conditions in Canada.

"Inquiry was also made into the status of the two methods of converting coal into oil, of which much has been recently heard, namely, the Bergius process of hydrogenation and the synthetic processes of Fischer in Germany and Patart in France. The former process is much further advanced than the latter, and after 16 years of experimental work and the expenditure of some millions of dollars it is now about to be applied in a modified form on a commercial scale in a plant almost completed at Leuna. This plant proposes to use German brown coal, which it must be understood is very different to Canadian lignite; and when operating is expected to produce 100,000 tons of oil annually. Costs of production under the Bergius system are of course yet unknown, but it is estimated that from brown coal at $2.50 per ton an oil similar to natural petroleum can be produced at about $3 to $3.25 per barrel.

"If these estimates of cost are correct, the process has at present no possible commercial application on this continent where crude petroleum can be produced from wells and is selling at less than half that figure. Owing, however, to the

LEGALS

NOTICE OF RECEIVER'S SALE OF OIL AND GAS LEASE

Notice is hereby given that the undersigned Receiver will, under and by virtue of a certain judgment and decree of foreclosure made and entered by and in the District Court of Creek County, Oklahoma, in Cause No. 12673, wherein the Tulsa Rig, Reel & Manufacturing Company was plaintiff and Lawrence Anderson, Executor of the Estate of Clint Anderson, deceased, et al, were defendants and cross-petitioners, and by virtue of an order of sale issued out of said court and to me directed, on the 5th day of November, 1927, I will on the 10th day of December, 1927, at the hour of 10 o'clock A. M. offer for sale at public auction, at the North front door of the Courthouse in the City of Okmulgee, County of Okmulgee, Oklahoma, to the highest and best bidder for cash, free and clear of all liens and incumbrances, the following described property, towit:

An oil and gas mining lease on and covering the Northeast quarter of the Southeast quarter of Section 22, Township 15 North, Range 11 East, Okmulgee County, Oklahoma,

known as the Tabor lease, together with all of the oil wells, oil well casing, tubing, rods, pumps, engines, boilers, power plants, rig, derricks, machines, machinery, houses and equipment of every kind and character thereon and thereunto belonging.

Said sale will be made subject to confirmation by the District Court of Creek County, Oklahoma, and possession of said oil and gas mining lease, together with all of the appurtenances thereon and thereunto belonging, will be delivered to such purchaser immediately upon approval of said sale.

Full information concerning the five wells on said lease, the amount of production, material and equipment thereon may be had on application to the undersigned at his office in the city of Okmulgee, Oklahoma, or to Mosier & Mosier, Attorneys, Muskogee National Building, Muskogee, Oklahoma.

I. H. COX,
Receiver

TRIBAL OSAGE OIL LEASES AT PUBLIC ACTION

December 12, 1927, by United States Government.

December 12, 1927, at Pawhuska, Oklahoma, about 19,360 acres will be offered for oil leases in quarter section tracts. Bids will be for bonus in addition to royalties, 25% payable on day of sale, balance in three annual installments, with acceptable security. Within advertised area there are about 9,903 oil wells producing from one barrel to 1,000 barrels each, the total daily production for September, 1927, being about 62,000 barrels; also there are about 60 wells drilling. All lands are now leased separately for gas. Blue print maps of area advertised, showing tracts producing oil or gas, can be had for fifty cents each, also logs of producing oil or gas wells for twenty-five cents each well. Write U. S. Superintendent, Osage Agency, Pawhuska, Oklahoma, for maps, logs or other information.

fact that the Leuna plant will be operated in connection with a huge fertilizer plant from which very cheap hydrogen can be obtained, costs of production are expected to be below these figures. Control of the application of the Bergius process throughout the whole British Empire is in the hands of Sir Alfred Mond and his associates.

"The synthetic process of making oil from mixtures of carbon monoxide and water gas was seen in the laboratory of the Kaiser Wilhelm Institute of Coal Research, Mulheim. This process is not so far advanced as the Bergius process and is still in the laboratory stage of development. Technically the process has been proven, but it is still a far cry to the time when it may be applied commercially.

"Both processes and especially the Bergius are, however, of such interest that the department will and is in a position to keep in close touch with the progress of their development and in this respect the trip was especially valuable."

EXHAUSTED OSAGE GAS FIELD IS RESERVOIR

(Continued from Page 82)

from any natural gasoline plants operating on the lands, although the company having the oil leases has the right to manufacture natural gasoline from the wells on the property, and all accompanying rights.

Demand Fluctuates

The tail (or residue) gas, having a certain market value as fuel, has a varying seasonal demand. The common experience has been that winter demands for this fuel are about five times as great as summer demands, and very often during the summer season the gas lessee finds himself with an abundant supply of natural and tail gas, while his market is limited. To handle the gas entering his lines during the summer months has often taxed the facilities of the gas lessee, and the natural storage mentioned has done much to ease the problem for the Tidal Oil Co.

In Section 35-27-7, and Section 2-26-7, a shallow gas field was found in 1921, when drilling wells seeking oil in a deeper formation touched the gas. The wells had a rather small initial output, with a rock pressure of 290 pounds. The gas was conserved according to the Osage regulations, and deeper penetration discovered some small oil production.

A year or so later, during the drilling activity of the Burbank Field, the gas from the old wells was found to have an ample market, and was piped across the 9 miles to the new field. The demands of Burbank soon exhausted the small gas field, and it remained abandoned until Ted Hall, one of the Tidal engineers, conceived the idea of testing it out with a view to using it for storing the gas which at that time had reversed in flow, and was coming out of the Burbank Field.

The Burbank Field was daily allowing tail gas to blow idly and unrestrained into the atmosphere, as there was little market for it owing to season.

The exhausted gas field was tested out, and examination showed that it presented an ideal storage plant. There was not a trace of water in the body of sand, and the area around the sections mentioned were believed to constitute a small lensing which was ideal for storage purposes.

Booster Stations Built

After much investigation, the Tidal company constructed two booster stations, one in the northwest quarter of Section 4-26-6, and one in the northwest quarter of Section 34-27-6. The former had a daily capacity of 13,000,000 feet, and the latter 4,000,000 feet.

The necessary line changes were effected, and the old line which had previously been used to transport the gas from the old field to Burbank was now reversed, and was utilized to carry the gas from the Burbank Field to the reservoir. The old wells which had been abandoned were examined, and where necessary, wells which still had old equipment in them were tightened up, and rendered gas tight, prior to the reintroduction of the gas.

The small area comprising the old gas field has proved to be abnormally tight, and two years' operation has disclosed a very limited loss of gas stored in the earth there.

When the original gas was found in this region, it was touched at a depth of 928 feet. The wells had an initial rock pressure of 290 pounds (slightly low for this depth). When gas was delivered from the field to the drilling wells at Burbank, withdrawal of 975,813,000 feet of gas from the wells caused the pressure of the gas field to decline from 290 to 123 pounds. The next check of the field resulted in the revelation that 135,000,000 feet of gas produced made a further decline in rock pressure to 93 pounds. These are the only available figures regarding the output of the field.

Rock Pressure Increased

Then the reintroduction of gas began. The first measurements showed that 158,005,000 feet of gas sent back into the ground increased the rock pressure from 93 to 128 pounds. From last August to November 222,384,000 feet of gas replaced in the field brought about a further increase in rock pressure, and the present pressure is 190 pounds. During a series of tests made intermittently since this operation has been going on, no leaks have been observed.

In this connection it is interesting to compare the input and output figures of the field. Withdrawal of 135,000,000 feet of gas from the field caused the pressure to drop from 123 to 93 pounds. Then 158,005,000 feet sent back into the ground increased the pressure from 93 to 128 pounds, a small difference in pressures in view of the volume of gas handled.

This interesting field practice is not entirely new to the industry, for it has been successfully used in the gas fields of West Virginia, and in a part of Kentucky. According to available information, however, it is the only spot in Oklahoma where this is done. Indications point to few other fields being similarly treated, at least in Oklahoma. The size of the lease tracts, usually small, the fact that most of the sands are underlaid with salt water, the fact that few depleted fields are gas tight underground, for the most of them have some small sand trends leading off—these conditions, among others, will prevent extensive or immediate use of underground reservoirs.

The practice is feasible, economical, and assures the producer income from gas which formerly was lost. It gives to the gas distributing concern cheap storage with the added feature of ample room, and it gives to the adjacent communities additional fuel for either industrial or domestic consumption.

It marks another chapter in the progress of oil and gas production.

DEFENSE SUPPLY ASSURED

As to the industry's relation to the Government in supplying the necessary emergency needs of the Government for oil in time of war. It is hardly conceivable that any emergency should arise that will call for a greater reserve than is normally held by the industry. Also if, and when such emergency should arise, there is the known production which today amounts to about 750,000,000 bbls. per year, the uses of which can be curtailed to such degree as may be necessary to meet the emergency requirements of the Government.

If this assurance is not sufficient for the protection of the Government it could, and from an economical view might well build up its own reserve, of storage stocks for emergency demands, by buying oil at the proper times. In this manner, the Government could save money on its purchases and could create a reserve of stocks of, say, 100,000,000 bbls. These would not necessarily have to be located at any particular point, as methods of transportation or exchange could easily be worked out.—J. Edgar Pew, vice president American Petroleum Institute.

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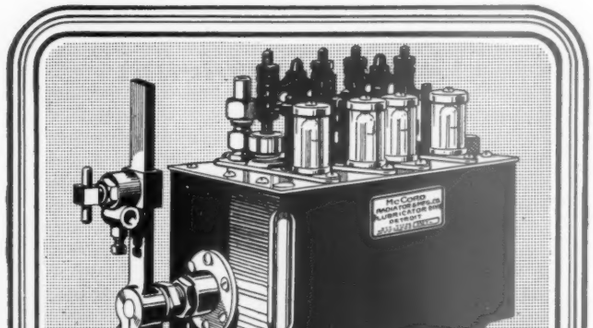


GAS PRODUCED IN NEW BRUNSWICK UNDER AN EXCLUSIVE CONCESSION

By Victor Lauriston
Staff Correspondent

CHATHAM, Ontario, Nov. 26.—The province of New Brunswick for many years has possessed, in the Stoney Creek Field a gas production of importance. This production was developed as the result of the efforts of New Brunswick capital to open a commercial oil field.

Development work in New Brunswick first was instituted in the early sixties, and it was carried on intermittently till the organization of the New Brunswick Petroleum Co. This company, financed by New Brunswick capital, obtained from the provincial government exclusive drilling rights over an extensive area. This exclusive concession has had the effect of limiting operation to the one company and its various successors, operating under the original grant.

The successors include Maritime Oilfields, Ltd., in which British capital was interested; and New Brunswick Gas & Oil Fields, Ltd., a merger of the two earlier companies. The original operations of the New Brunswick Petroleum Co. were along the Memramcook and Petitcodiac Rivers, in Westmoreland County; and after a shallow oil production there had petered out, drilling was extended into Albert Couunty, opening the present Stoney Creek gas field. The production of this field has been piped for many years to the city of Moncton and the town of Hillsboro. In addition to the gas, there is a small incidental oil production from the gas wells.

In 1921 the D'Arcy Exploration Co., a subsidiary of the Anglo-Persian Oil Co., undertook some work in the New Brunswick fields, operating under the concession held by the New Brunswick Gas & Oilfields, Ltd. The work of the D'Arcy Exploration Co. followed two distinct lines: first, deep drilling for free oil, and second, the reduction of the Albert oil shales for their oil content.

Three Deep Tests

Along the first line of endeavor, the D'Arcy Exploration Co. in 1921 put down three deep tests. One at Cape Bald (St. Andre de Shediac) was abandoned in August, 1921, at a depth of 2,516 feet. A second, 2 miles north of Rogersville Station, was carried that year to 2,091 feet; and a third at Memramcook West at 2,580 feet passed through the Albert shale areas without encountering oil or gas. All three tests were resultless.

The oil shale operations by the same company in 1921 included the setting up of a Wallace retorting plant sufficient to take a charge of about 1,000 pounds of shale. The test indicated an average production per ton of shale amounting to around 37½ gallons of oil; production costs being ultimately placed at slightly less than $4 per barrel.

The Rogersville test later was carried to 3,601 feet; the Memramcook test to 2,720 feet; and a test at Gautreau Village, east of the Petitcodiac, to a depth of 1,878 feet. Neither oil nor gas was found, but in the Gautreau test at 1,261 feet a bed of rock salt was encountered with a total thickness of 528 feet. Eliminating a portion of this which was mixed with shale, a net thickness of 455 feet of excellent salt was found.

The total expenditures by the D'Arcy Exploration Co. in connection with this deep drilling, and work done under arrangement with Maritime Oilfields, Ltd., holders of lease No. 115, were reported at $541,496; while expenditures between 1920 and 1922 on the experimental shale plant at Rosevale were placed at $176,861. With this largely resultless outlay, the company discontinued its operations in the New Brunswick fields.

Work was carried on, however, largely in the Stoney Creek Field by the New Brunswick Gas & Oilfields, Ltd., whose operations were devoted chiefly to cleaning out and deepening old producing wells and drilling a few new wells in order to maintain the natural gas supply. The general result of these operations has been to maintain a sufficient natural gas production for the company's purposes and to somewhat increase the small oil production from this field.

Improvement Shown

The year 1926 showed improvement in both oil and gas production. The value of the gas produced showed an increase of some $18,000 and of oil some $1,600 over the preceding year's figures, the total value of the gas for 1926 reaching $128,152.50 and of the oil, $15,360.35. The gas field, under careful management, has shown a tenacity of production unusual in the history of gas fields.

The 1926 operations included the erection at Weldon of a 7,500-bbl. steel tank for oil storage, and as a possible nucleus of a battery of tanks in case refining operations should be undertaken. The Weldon tank was used for storage, the oil being piped from this point to subsidiary tanks at the railroad, whence it was transferred to tank cars for shipment to the Imperial Oil, Ltd. plant at Dartmouth, Nova Scotia. Some 15,000 bbls. were shipped in the first three months. Previously, the crude oil was used locally. It is a high-grade crude, similar to the Petrolia product.

During 1926 from four to six drillers and the same number of tool dressers were employed in the field; the staff also including a chemist, surveyor, oil production foreman, oil pumper and assistants, gas well attendant, storekeeper, teamster, and other occasional labor. Rig builders and assistants were used at intervals during the working season. An account of the year's operations shows the following results:

Well No. 60 was continued to a depth of 2,419 feet, and at this level furnished gas at the rate of 336,000 feet for 24 hours with a final rock pressure of 1,190 pounds. The gas was turned into the line and drilling continued to a depth of 3,354 feet, with a flow of gas at that time of 222,567 feet. A small quantity of oil was encountered in this well.

Well No. 71 already had been drilled to a depth of 2,194 feet. It was terminated at 2,947 feet in sand and shale with no further production of oil or gas.

Gas Turned Into Line

Well No. 72 was deepened to 3,570 feet, terminating in shale. Gas was found in the fourth group of sands to the extent of 44,000 feet and this was turned into the line. Green oil was found in the fifth group with an initial flow of 41 bbls., settling down to 5 bbls.

Well No. 73 was a new one located on the Franklin Steeves land, and situated between wells Nos. 71 and 39. It was run to a depth of 2,008 feet in shale, and difficulty was experienced on accouunt of an inflow of salt water, but a flow of 500,000 feet of gas was obtained, which was turned into the line. This flow, however, decreased to almost zero during the winter. There was a rock pressure of 396 pounds. Drilling was continued to a depth of 3,022 feet, and the well finally produced somewhat over 11 bbls. of oil per day.

Well No. 74, a new one on the Mrs. Nehemiah Steeves farm, between wells Nos. 71 and 72, reached a depth of 3,008 feet, ending in shale and producing a small flow of gas and about 8 bbls. of oil per day.

Well No. 75 was a new well on the Franklin Steeves farm, 1,175 feet southwest of well No. 68. At a depth of 1,876 feet there was a slight showing of oil. Drilling was suspended at 3,070-foot depth with a large inflow of salt water. The well in its final stage was nonproductive of gas or oil.

Well No. 76, a new well on the land of Elliott McLatchey, between Nos. 18 and 54, reached a depth of 2,775 feet with a small flow of gas amounting to 189,584 feet. This gas was turned into the line. A fair supply of oil was found in the third, fourth and sixth groups of sands.

Well No. 77, a new well 200 feet northeast of well No. 25, at a depth of

2,054 feet produced gas to the amount of 1,000,000 feet a day.

Well No. 78, a new well 370 feet southwest of well No. 45 and 1,206 feet northeast of well No. 77, was sunk to a depth of 1,545 feet in shale.

Well No. 79, a new well 1,700 feet southeast of well No. 26, on the land of Frederick Steeves, in the 1926 season had reached a depth of 655 feet in red marl.

Drilling Continued

In the present year the New Brunswick Gas & Oilfields, Ltd., has continued drilling, though detailed reports are as yet unavailable. The chief result has been the opening of two new wells, thus strengthening the company's natural gas supply. The cleaning out and deepening of the older wells has been continued with good results; and the natural gas production for the year is likely to run close to, if it does not exceed, that of 1926.

The oil obtained in the Stoney Creek wells is of good quality, the following being the detailed analysis:

Specific Gravity	0.8392
Flash point	68° F.
Cold test	18° F.
Sulphur	0.04%
Calorific value B.t.u.	20,504
Benzine (sp. gr. 0.717)	14.00%
Burning oil (sp. gr. 0.795)	37.60
Lubricating oil	40.46
Paraffin wax	1.94
Coke and loss	6.00

Year—	Total Expenditure	Crude Oil Gallons	Natural Gas Value	Total Production Value	Royalty to Govt.
1909		31,776	$ 67,947.07	$ 69,689.72	$ 3,484.48
1910		104,204	15,883.65	20,037.07	1,001.85
1911	$ 403,299.24	84,115	1,384.00	4,783.71	239.18
1912		5,572	2,793.00	3,213.85	160.68
1913		1,910	510.00	672.35	33.62
1914	58,695.40	34,615	58,814.40	59,628.40	2,981.42
1915	17,964.50	27,606	41,200.48	58,643.40	2,932.17
1916	77,203.00	27,250	71,936.37	73,488.40	3,674.42
1917	72,928.03	129,894	96,180.73	104,351.00	5,217.55
1918	81,651.18	97,763	106,636.15	113,319.40	5,665.97
1919	94,173.00	123,819	113,303.00	121,600.00	6,080.00
1920	75,767.00	174,827	134,183.00	148,460.00	7,423.00
1921	130,486.91	229,434	133,507.15	158,330.71	7,916.53
1922	129,126.28	238,175	144,995.36	164,503.53	8,225.16
1923	90,275.07	267,519	134,797.34	159,111.86	7,955.58
1924	129,840.13	210,536	111,822.09	129,388.36	6,469.40
1925	130,071.38	187,050	119,823.93	133,528.05	6,676.40
1926	185,363.45	203,410	128,152.50	143,512.85	7,175.64
Total	$1,676,774.67	2,179,475	$1,483,869.42	$1,657,263.66	$83,313.06

The oil production is reported to have reached approximately 100 bbls. a day for the entire field, this being incidental to the much larger and more important gas production. After some years selling the oil locally, unrefined, the production is now being shipped to Imperial Oil, Ltd., though the New Brunswick Gas & Oilfields, Ltd., contemplates building a refining plant if the production can be increased to a point sufficient to warrant the expenditure.

Biggest Concession in Canada

The New Brunswick Gas & Oilfields, Ltd., holds a long-term lease on 10,000 square miles in the eastern part of New Brunswick. This concession, which gives exclusive drilling rights, is the largest single oil concession in Canada. It covers practically the entire eastern portion of the province of New Brunswick, and almost the entire potential oil and gas-bearing areas of the province, the territory within the lease being quite largely carboniferous, while there is very little carboniferous outside of it. The concession is subject to a production royalty to the provincial government.

The following statement shows the results obtained since 1909 by New Brunswick Gas & Oilfields, Ltd., and its predecessors in the New Brunswick fields:

ANGLO-PERSIAN CHAIRMAN DISCUSSES OVERPRODUCTION AND PROSPECTS

At the recent annual meeting of the Anglo-Persian Oil Co., Ltd., Sir John Cadman, K. C. M. G., chairman, presided. Following are extracts from his address:

The wells at Masjid-i-Suleiman continue to flow strongly and under perfect control. Production amounted to over 4,800,000 tons, which compares closely with the estimate of 4,750,000 tons given in last year's review of our operations. The current year's production will probably exceed 5,000,000 tons. Two features stand out in the operations in the main fields during the year. For the first time in their history, drilling shows a decrease; and for the first time we started to produce gasoline on a commercial scale from field gas. As regards drilling, we have almost demarcated the great structural unit that constitutes this remarkable field, and our drilling is now practically confined to the marginal areas. The reduction in drilling implies not only large field economies, but also release of personnel and material for testing new areas in other parts of the concession.

Gasoline Extraction

In his speech in November, 1925, Lord Greenway reported that a scheme had been decided upon for the recovery of petrol from field gas. The first units have been running efficiently for some time. They deal with 300,000,000 feet monthly from which the satisfactory yield of 2½ gallons of high-grade petrol per 1,000 cubic feet is obtained. Additional plant is now in course of erection which will enable us to extract 2,250,000 gallons of spirit monthly from 900,000,000 feet of gas. I should explain that, after extraction of this gasoline, the "stripped" gas is used for power purposes generally throughout the field, but as the quantity available is largely in excess of our requirements, we are now engaged on other lies of research which may possibly yield remunerative results.

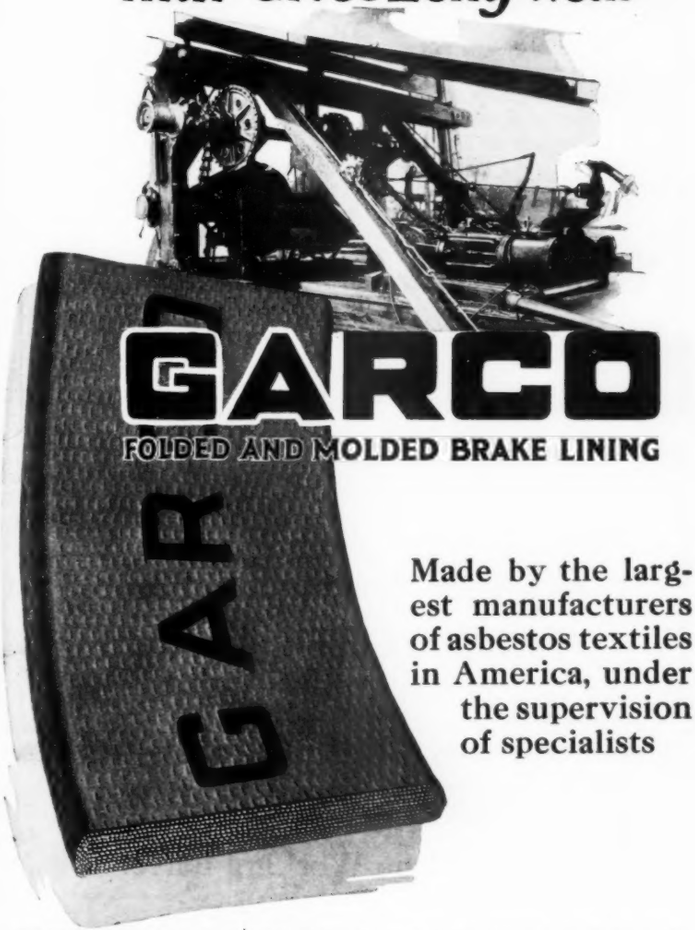
The testing of seven outside areas in Persia has proceeded with commendable rapidity in spite of many difficulties, but, although a total of over 37,000 feet has been drilled, the main limestone has so far not been reached in any of them, and several of these wells are at depths which will make further progress difficult and slow. In Persia it has been found hard to deduce from surface evidence the relative position of the underground reservoir rock; we therefore decided some time ago to attach a skilled section of geophysicists to our geological staff. These men have been, and are, continuously conducting surveys by means of the torsion balance. At the same time active research is being conducted in seismographic, magnetic, electric and sonic methods. While such scientific methods of testing cannot give the assurance which the drill alone can afford, they form a valuable addition to our geological analysis because of the readiness and economy with which they can be applied. They are especially important to a company like ours, whose concession area is so vast; and their employment is part of a settled policy of taking the fullest advantage in every phase of the oil industry of the discoveries of modern science.

During the year we have added to the capacity of the pipe line by laying a further 100 miles. We can now, at any time, secure increased "throughput."

Naft Khana

The crude production from this area, though capable of satisfying a larger demand, is at present restricted to the requirements of the new Alwand refinery which is now supplying Irak with indigenous fuel and light products. We have nine wells drilling in this area, but progress is necessarily slow by reason of the exceptionally high pressures met. Although there is little doubt as to the possibilities of this field, we have not yet sufficient evidence of the structure as a whole to justify pipe line equipment.

The Brake Lining that Gives Long Wear



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Manufacturers of Natural Gasoline

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"The Working Barrel That Works"

Over sixty thousand now in use from Pennsylvania to Argentine and from Oklahoma to India wherever oil is produced.

No Barrel can compete with the McGregor in price and saving. It comes with the barrels, valves, valve stem all complete at a price slightly more than what the old style Barrel would cost. Pumps as fast as old style barrels that are attached to the tubing.

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SKINNER Clamps stop leaks

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M. B. SKINNER CO., 562 Washington Boulevard, CHICAGO

Should the Persian government grant us the facilities for which its consent has been sought, we hope to be able to develop more fully the Persian sector of this area; a satisfactory result from this sector would do much to support the case for an export pipe line, and we hope that such results will be eventually forthcoming.

Irak

The Turkish Petroleum Co., in which we have a large interest, is working in Irak. Following the extensive geological survey referred to last year, test wells are now being drilled in several areas. These tests cover a large extent of the country, and as Irak is practically without roads, a great deal of road construction has been necessary. This has been carried through in spite of innumerable difficulties. The successful results secured from the Kirkuk area would appear to indicate a very promising future for this company, in which success the Anglo-Persian company will participate substantially.

Albania

Test drilling is being carried out on three areas, two of which promise to be deep. On the third area, as Lord Greenway announced last year, a good show of heavy asphaltic oil of low value was struck. We have obtained oil in two wells, but have failed to find it in two others, from which it appears evident that the total producing area will not be of very considerable extent. Pending the completion of other wells now drilling with the object of defining the extent and capacity of the oil zone, it would, however, be premature to arrive at any conclusions as to ultimate prospects.

Argentine

Production has exceeded our original estimate for the year, it having reached 150,000 tons. All this oil has been advantageously disposed of in the local markets. We do not anticipate any larger production during the current year, as the field is of limited extent.

Persia

The oil industry of Persia, like every other industry of the country, has benefited from the general security established by His Imperial Majesty the Shah.

I take this opportunity to address the people of Persia and ask them to compare the conditions of that part of their country in which we operate, with what it was before the oil industry was established. I am sure that all fair-minded Persians will agree that the changed conditions have been wholly in the direction of advancing their country's welfare.

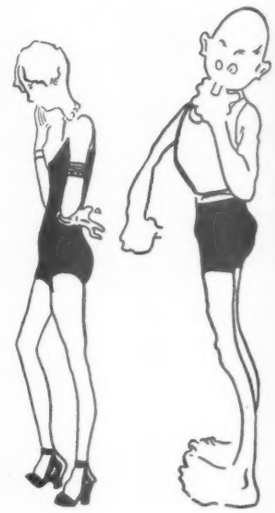
Our method and efforts have not infrequently been adversely criticised in Persia, but I feel sure that such criticisms are due to wrong impressions arising from lack of information, rather than any absence of goodwill or appreciation of what we have accomplished. We want Persians to feel that our activities in Persia are not only directed toward extracting oil, but also toward developing a great national industry in the country.

We are educating and training Persians to occupy higher and more responsible posts in the company; we are constantly increasing the number of our Persian employes. These efforts are based on the well-established and recognized principle that the maximum success is only possible with the co-operation and goodwill of all concerned.

Prospects and World's Markets

I am sure that no one fails to appreciate the wisdom of the generally conservative policy adopted by the company in the past in order to prepare itself for the inevitable demands of the future—and to safeguard itself against the vicissitudes of fortune. At the last general meeting my predecessor in the chair very properly refused to assume the mantle of the prophet. Even then, as he pointed out, there were signs of excess in production; but it was by no means clear that the steadily growing consumption would not establish an equilibrium between supply and demand. Taking the long view—the short space of one year is by no means sufficiently long—I see no reason to depart from that opinion; but it cannot be denied that for some months past the petroleum industry has been in an extremely unsettled condition.

perhaps



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in the cold, with old fashion equipment. Modern drilling and producing methods have no place for old style, leaky boiler gauge cocks.

Use Shaffer's, the big boiler manufacturers such as Farrar & Trefts, Broderick, Donovan, Kewanee, Lucey and Titusville "do." They equip their boilers with the best—you can do the same.

Try a set from your supply store and you'll wonder how you ever got along without them.

J. E. SHAFFER CO.
316 Mid-Continent Bldg.
Tulsa, Oklahoma

Price $2.25

All Parts Are Interchangeable

Made in two sizes, ½ or ¾-inch. Furnished with combination fibre wheels or a special all-metal wheel for strong alkali water. Extra wheels 25c each.

Eastern Service For Remote Districts

We always are glad to receive inquiries about shooting wells at great distances from our stations and usually we can arrange to handle such business. We recently sent two cars and two shooters 600 miles over difficult mountain roads to shoot 500 quarts in a well in British Columbia. Right at the moment we have a shooter in Mexico shooting several wells for a big Company there.

No matter where you are, if you have a well to shoot write or wire us and we will get to you. And you may depend upon it, we will send an Eastern expert who knows his business.

THE EASTERN TORPEDO of Ohio COMPANY
412 Palace Building
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Owensboro, Ky. Shelby, Mont.
Casper, Wyo.

To the Oil Industry and the Men in It

The Oil and Gas Journal is an invaluable and most necessary asset.

It is the one fearless champion of the entire industry. It is on the alert constantly, watching conditions, keeping oil men informed, and offering sound recommendations for improvement.

Read it every week and always renew your subscription promptly.

The Oil and Gas Journal
Tulsa, Okla.
"The Oil Man's Bible"

The decreased exports from Mexico have been more than offset by large overproduction in the United States, and by a significant advance in production from South America and elsewhere. The abnormal situation created by excessive competitive production in the United States, a country which ordinarily dominates the position in the oil world, has been rendered more acute by the larger exports from Russia, where the peculiar conditions seem to prevent—for the time being, at least—the ordinary operation of economic law. It is obvious that this large source of supply, freed temporarily from the various charges and restrictions which affect the production of petroleum in other parts of the world, must be a disquieting factor in a market situation already very much disturbed. At the same time, it is a factor of which the influence in the industry has by now in some measure been discounted, and it seems unlikely to assume a much greater importance than it at present possesses.

Overproduction

Overproduction may, for a time, mean very cheap products for the consumer. It means also industrial disorganization, the elimination of many of the smaller units in the industry, and dissipation of one of the world's most precious assets. I am not amongst those who claim that the world's resources of petroleum are on the eve of exhaustion; it would, however, be foolish to imagine they are illimitable. In my opinion, very many years must elapse before natural petroleum resources will be unable to meet the greater part of the world's requirements. Of course, the time will eventually come when the world may have to look for a great part of its supplies from secondary and synthetic sources, but he would indeed be an optimist who imagined that—on the reaching of such a stage—prices would remain as low as those existing in the past. Nowhere is this better realized than in the United States, which is the largest producer as well as the largest consumer. How to conserve that country's oil reserves—without stinting the present generation—is, perhaps, the greatest and most complicated economic problem the United States' authorities have ever been called upon to face. This subject has been debated for a generation, but owing to conflicting and diverse interests without any tangible result. There are signs, however, of a determination at last to grapple with this problem. Its satisfactory solution would equally imply a measure of advantage to America and the world at large. For years past America has met her requirements from her own resources. Her consumption exceeds that of all other users taken together; her need for supplies on a great scale will not disappear; and her wealth is immeasurably great. It is not difficult, in such circumstances, to foresee that consumers, everywhere, would suffer from high prices if the American demand should ever much exceed the American supply. A wise and considered policy of conservation—such as the best heads in America are now seeking to devise—whilst primarily in the interests of America herself, must therefore also be of ultimate benefit to all countries.

Persia's Advantage

I would like to point out that, in some respects, the Persian oil industry enjoys a position which the Federal Conservation Board would like to give the American oil industry as a whole. Our royalty holders speak with one voice. The interests of these royalty holders are those of the industry itself; clearly it is in the interests of Persia, as it is of this company, that production should be steadily controlled—that is to say, steadily regulated in conformity with the world's demands; that the reserves of oil underground should not be extravagantly and uneconomically forced to the surface, regardless of the world's requirements. Fortunately, we are not impelled to overproduce, which is so often the case elsewhere—owing to the feverish rivalry of offsetting competitors. In general, Persian oil is ideally situated to secure the maximum technical and economic advantage.

As to the prospects for the current year, it is more than ever difficult to venture a forecast owing to the very

Obtain real economy
by designing your flanges and rings correctly

A new chart which enables any engineer or draftsman to design forged steel flanges and rings in accordance with the new Waters formula has recently been published by the American Spiral Pipe Works. This new chart makes simple and easy the graphical solution of the formula for rings and flanges of all sizes from 4 to 100 inches in diameter. It will be mailed without cost by addressing

TAYLOR FORGE DIVISION
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"for 20 years the largest manufacturers of forged steel flanges."

O&GJ 12-1 Gray

"Central" Oil Country Tubular Goods

Large gas companies, after using "Central" Pipe, have commented upon its uniform lengths, perfect roundness, and careful beveling. These sterling qualities in "Central" reduce construction costs by speeding up the field work and, in addition, insure a tight durable line.
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on Pages 268-269

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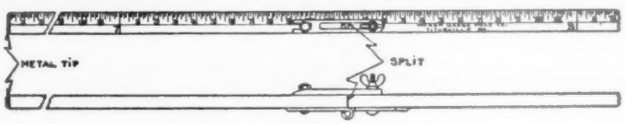
Any Length **For Oil Measurements**



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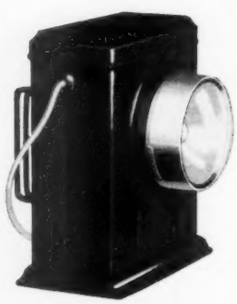

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THE FINEST light ever developed for workers in oil fields. Insures safety against fire and explosions. It is a powerful lantern, projecting a 300-foot flood of brilliant light. Burns by the hour on two No. 6 dry cells. Batteries last up to a year in ordinary usage.

Light but rugged—will last a lifetime. Made of sheet steel for tough wear and ribbed for extra strength. Finished in vivid red baked enamel. Durable. Attractive.

Scientifically designed for super illumination. Triple silver plated reflector, especially designed Mazda bulb, lens ground from select clear glass—all these elements precisely adjusted according to Delta standards for powerful light.

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Ajax ropes are carried in stock by the North Texas Supply Co., Cross Plains, Tex.; Rex Supply Co., Sour Lake, Tex., and Mid-Continent Supply Co., Fort Worth, Tex.

disturbed condition of the world's markets. I am bound to warn the shareholders that unless there is some radical change in prices there is likely to be a reduction in the profits of the company which may well affect the ordinary dividend. There is, however, one phase of the situation from which we may derive encouragement and confidence, and that is the steady and remarkable growth of the consumption of petroleum products in every part of the world. If the production of petroleum is far greater than ever before in the history of the industry, so also is the consumption. Further, I might also mention that the improved yields and the economies we are constantly striving to introduce into all phases of our operations represent an important, if only a partial, offset against the effect of overproduction and uneconomic prices.

MIXING NATURAL AND MANUFACTURING GAS

(Continued from Page 82)

be great or it may be very small depending upon the location of the exit pipe of the holder with respect to the inlet pipe. Obviously if the outlet pipe is exactly opposite or 180 degrees from the inlet pipe the evening-off effect of the holder will not be large, whereas if the outlet pipe is at 90 degrees from the inlet pipe the greatest good effect is produced. This is an important point in securing good results.

Mixing by Hand

"Our mixing is done by hand, that is the proportions are hand regulated. These proportions are controlled by valves and are governed by the indications of a recording calorimeter, which takes its sample directly from the mixing pipe. This sample is taken from the pipe about 50 feet from the point where the two gases come together and just before the pipe enters the gas holder. For check purposes another recording calorimeter records the B.t.u. value of the mixed gas issuing from the holder. This instrument usually reads on practically a straight line showing that the holder serves an important function in evening the mixture passing into it. This is the case because with hand regulation and in dealing with two gases of such widely differing heat value it is impossible to get just the correct proportions all the time and a small error in proportions gives an error in B.t.u. of an undesirable extent. For this reason it is not practicable to mix on the basis of metered proportions in the case of such widely different gases except as a rough check.

"Due to this feature of mixing gases of this nature, we have hesitated to install an automatic mixer. As we have not found an automatic mixer perfect enough to never go wrong, we have felt it safer to depend on constant hand regulation. If the gases being mixed were not at about the extreme limits of the heating value scale, we would have installed automatic mixing. Failure of an automatic mixer which is dealing with gases nearer together in heating value might not prove as disastrous.

"It seems that the chief problem in mixing gases is not in securing a constant even heating value alone. Other factors which are almost equally important, such as density and rate of flame propagation, should be given careful consideration, as these are the factors which can cause a great deal of customer complaint. These are the qualities which produce such effects as backfiring in the mixer, when a seasonal demand sometimes forces a company to use a different gas of equal heating value."

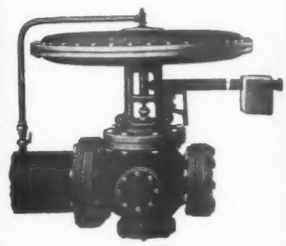
Louisville's System

The Louisville Gas & Electric Co., Louisville, Ky., reports different conditions entirely than that of the Elmira Water, Light & Railroad Co. The following is a communication received from the Louisville Gas & Electric Co.:

"Mixed gas is used in Louisville only during the winter months. During these months a minimum B.t.u. of 850 is maintained.

"The base supply is 18,000,000 feet of

Always on the job!



The C-F Automatic Cut-Off

It automatically closes the ports of the regulator valve.

The valves have to be opened by hand before the flow of gas resumes.

No chance for dangerous explosions.

If the diaphragm of the regulator should burst, this cut-off would stop the flow of gas immediately.

More than thirty years of experience in controlling gas pressure has taught us how to make this device dependable in its operation.

The Chaplin-Fulton Mfg. Co.

Organized 1884—oldest builders of gas regulators in the country. Built in all sizes, from 1 inch to 24 inches; for all services, 1 oz. up to 1,000 lbs. pressure to square inch.

28-40 Penn Avenue
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271

Quite Natural

As The Oil and Gas Journal leads in everything, it is quite natural that it should have the best petroleum publication classified section.

It is read with respectful consideration every week by thousands of oil men in all fields, refineries, pipe line stations, gasoline plants, supply houses and offices everywhere.

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The Oil and Gas Journal
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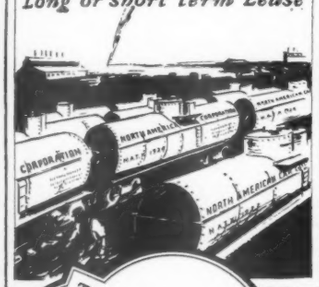
"Oil Engine Builders for a Quarter Century"

TANK CARS
Long or short term Lease



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Six Months Advance Notice

The largest oil well discovered in the last quarter of a century, and the third largest in the world, was completed in the Yates Pool recently.

SIX MONTHS AGO a Map and Cross-Section were published in The Oil and Gas Journal with a full page article directing the attention of oil men to the Yates Pool. The article described in detail, conditions, possibilities, the average cost of drilling, etc.

This gives you an idea of the manner in which The Oil and Gas Journal serves its readers in Texas. Subscribers who made use of the maps in The Oil and Gas Journal were repaid hundreds of times the small subscription price of six dollars a year. Send your order now!

The OIL and GAS JOURNAL

1,100 B.t.u. natural gas. This gas is diluted with sufficient producer gas, blue-water gas or carbureted gas to increase its bulk to that necessary to hold the load (which varies from 16,000,000 to 36,000,000 feet during the winter period).

"The B.t.u. of the gas mixed with the natural varies with the amount needed. For loads up to 23,000,000 feet, producer gas (made in water-gas generators by introducing steam and air simultaneously) of 150 B.t.u. is used. As the load increases the B.t.u. is increased, at times carbureted water-gas of 650 B.t.u. is used.

"The B.t.u. of the mixed gas supplied the city varies from hour to hour and from day to day. On an average winter day it will be 1,100 from midnight to 7 a. m., 950 from 7 to 8, 900 from 8 to 9, 850 from 9 to 2, 900 from 2 to 4, 875 from 4 to 6, 950 from 6 to 8, and 1,100 from 8 to midnight. Contrary to our expectations we have not had any complaints from our customers on this varying heat value during the two years we have been using this system. The heat value is varied entirely to suit our peculiar conditions which are governed largely by the fact that we can buy natural gas in the field for less than the actual labor and material cost of blue gas.

"Mixing gas has been to date accomplished simply by spraying the manufactured gas from an 8-inch perforated nozzle into a 16-inch pipe carrying the natural under about 40-pound pressure. The gas passed through about one-fourth mile of belt line before going into the low pressure mains and seems to have mixed very nicely. The control of the natural and mixed sent to the mixing point was manual and was calculated from meter readings on both lines.

"Beginning this year we plan to use a calorimeter controlled butterfly valve in the manufactured gas line.

"In brief, we find the mixing of natural with either producer, blue-water or carbureted water gas very simple.

"We find that except in a very few closely controlled industrial processes, a variation in B.t.u. does not cause complaint.

"We find the cost of operation insignificant.

"Incidentally more than 50 per cent of the 4.5 billion cubic feet of gas sold in Louisville is used in house heating."

Comments From Cincinnati

The Union Gas & Electric Co. of Cincinnati, Ohio, has the following comments to make on the mixture of gas:

"Our company has been mixing manufactured gas with natural gas for a number of years. At the present time and for the past two years we have been mixing producer gas at one station and blue gas or carbureted water gas at another station.

"We have a capacity of approximately 10,000,000 feet of producer gas; 12,000,000 feet of blue gas or 20,000,000 feet of carbureted water gas per day.

"We experience practically no trouble in mixing these gases, nor do we have any trouble with our customers in the use of mixed gas, as supplied by our company.

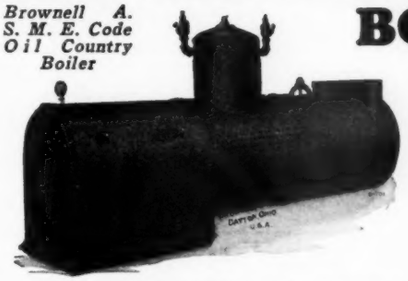
"We attempt at all times to maintain a standard of approximately 900 B.t.u. in mixed gas. We have a recording calorimeter installed at each of the mixing stations and we are successful in maintaining quite a uniform quality of mixed gas. We use a baffled drum as a mixing chamber for the natural and manufactured gas.

"In some instances, the two streams of gas to be mixed are brought in at locations opposite each other in the tank; in other instances the streams meet at right angles. There is really no preference, as far as I can see, as to the better method of mixing. I might also say, in one of the mixing chambers we bring the gases into the chamber tangentially, with the idea the whirling motion thus established within the chamber might mix the gas more uniformly than otherwise. We have no particular preference as to design of mixing chamber from our experience with existing equipment.

"We have attempted on numerous oc-

Brownell Hi-Pressure BOILERS

Brownell A. S. M. E. Code Oil Country Boiler



For oil country use Brownell offers a line of steel boilers specially designed for oil country needs.

Correct design, accurately known strength, superior craftmanship feature the Brownell line, and 71 years of boiler making experience stand "four square" back of them.

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Powell Valves

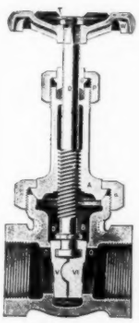

Fig. 375 White Star Gate Valve

Powell White Star Gate Valves are obtainable in bronze or iron body bronze mounted.

Bronze White Star Gate Valves are furnished with taper seats and double wedge Powellium Nickel discs, sizes ¼ to 3 inches.

Iron Body Valves have Powellium Nickel seat and disc rings. Sizes 2 to 24 inches.

All Powell Products insure the utmost in service under all conditions.

THE WM. POWELL COMPANY
2521-2531 Spring Grove Ave., Cincinnati, Ohio

Complete Analyses

Made of Natural Gas Including Helium Content, Thirty-five Dollars

Helium content only Twenty-five Dollars

THE HELIUM CO., Dexter, Kans.

Long-lived, self-adjusting Packing— Daniel's P. P. P.

P. P. P. Rod Packing meets all the demands of pump and engine requirements in the oil fields.

The continuous duty demanded on pumps and engines puts a heavy strain on rod packings. P. P. P. is the packing best fitted for this service.

Its automatic adjustment to cylinder pressures, and its easy bearing on the moving rod, permits full power transmission and insures long life to packing.

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Steel Oil Storage Tanks, Condensers, Stills, Refinery equipment of every kind.
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Box C-129, Oil and Gas Journal

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Superior Forged Pipe Tongs—Oil Well Tool Wrenches—Box and Pin Forgings—Hooks—Vises—Wrought Anvils and other Oil Well Tools
Our Tongs are made of the best material—they will grip the pipe and stand the test for strength.
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Best shapes and qualities always in stock.
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It will keep you reliably informed and provide you with information not obtainable elsewhere.

casions to locate stratification of gases in the holders, but as a result of many tests have been unable to determine anything of this kind. We are also confident no stratification takes place in the gas mains themselves."

Buffalo Satisfied

The Iroquois Gas Co. of Buffalo has an abundant supply of natural gas and only mixes a small amount of coke oven gas with its natural gas during the peaks in the winter time, the amount being so small that it has not experienced any difficulty in making the mixture. Its total sendout is approximately 90,000,000 feet per day with only approximately 10,000,000 feet of manufactured gas. It experiences very little difficulty in making this mixture. It mixes the gas by allowing manufactured gas and natural gas to enter a large gas holder. The mixture is taken out and pumped into a distribution system.

Our experience has been that where natural gas production costs equal that of manufactured gas, so far as the service to the customers goes we can obtain and do obtain as good results with manufactured gas as we do with natural or a mixture of the two.

It seems to me that the Louisville Gas & Electric Co. has hit upon the right solution when it says that when it can buy natural gas for less than the actual labor and materials cost for blue gas, it distributes natural gas. If it could manufacture blue gas for less than what natural gas costs undoubtedly it would sell blue gas.

In our case, in two localities it has been uneconomical to drill for natural gas because we can buy coke oven gas cheaper than the natural gas can be produced. We also find that the service rendered with mixed gas and manufactured gas is as good and better than with natural gas. Therefore, we are gradually allowing these natural gas fields to die out and augmenting the supply with manufactured gas. One reason why the customers prefer mixed or manufactured gas to natural is that the mixed and manufactured gas has a much higher flame temperature than natural, causing the customer to believe that the manufactured gas has more heat units.

Difficulties Encountered

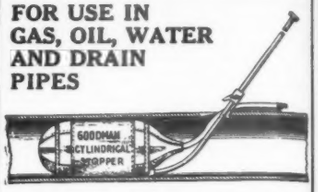
You will be interested in hearing of some of the difficulties we experienced upon the changing from natural gas to a mixed gas. As explained above, due to the difference in the specific gravity of the two gases, the amount of gas passing through the orifices of the gas appliances is very materially changed; also, due to the high flame propagation of the mixed gas, it is necessary to make adjustments on the air mixers to obtain good service. We had been forewarned by the Iroquois Gas Co. that we would experience trouble from this source. In order that the trouble would not all come on the day that we changed from the natural gas to the mixed gas, we had a crew of men going from house to house in the territory where the gas mixture was to be changed making adjustments on the gas appliances as well as reaming out the natural gas orifices, several days before the change.

We found that it was necessary to change the entire mixture and burner in most of the types of space heaters. This required considerable time and expense on our part. The expense in making these adjustments and changes was borne by our company.

We experienced probably more trouble than other companies who have changed from a natural gas to a mixed gas, because it was necessary to make the change in December, at the time when most people were using gas for space heaters and furnace burners. In the case of furnace burners, it was necessary in most cases to change the entire outfit.

No doubt we experienced a great deal of trouble owing to the fact that we dropped from 1,100 B.t.u. natural gas to 750 B.t.u. mixed gas. After all the adjustments were made, our customers were better satisfied with their gas service than before.

FOR USE IN GAS, OIL, WATER AND DRAIN PIPES



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TEXAS OIL MAPS
County and District
Catalog on Application
HEYDRICK MAPPING COMPANY
Wichita Falls, Texas

Of No Value Unless Used

The railroads, the public utilities, the packing industry, found the most effective means of dealing with popular misunderstanding and resulting legislative interference was by placing the plain facts about their business before the general public.

The oil business found it equally effective in broadcasting the facts and arguments presented in "The Oil Industry's Answer" nearly four years ago. Agitation for government control of gasoline prices, then raging throughout the country, has practically died out. The public understands it is getting a product that has been cheaper than any other necessity since before the war, was cheapest of all commodities during the war, and is so today, as proved by the Government's own figures.

The present agitation for government control of the production of oil on the plea of conservation of natural resources is a new form of attack on the industry. The most effective way of meeting that agitation is to give the public the facts and for that purpose The Oil and Gas Journal has compiled "The Oil Industry's Answer Today," which is made a part of the present issue of The Oil and Gas Journal on the eve of the meeting of the American Petroleum Institute at Chicago and the convening of Congress at Washington.

While oil men will find much of interest and value in "The Oil Industry's Answer Today," it was not prepared specially for them. It was intended for the information of Congress and the great public which needs to know the facts about the oil industry if the industry is to be justly judged and fairly treated.

The Oil and Gas Journal has assembled the evidence and presented the arguments in this publication which is presented to the industry at large for whatever use can be made of it for the enlightenment of the public.

The success which attended the general broadcasting of "The Oil Industry's Answer" of 1924, which is still being used in every statement on behalf of the industry, suggests that like success will follow similar use of "The Oil Industry's Answer Today."

In that spirit The Oil and Gas Journal offers it to the industry which should remember that it will be of no value unless used.

Oklahoma-Kansas and Eastern Pipe Line Report

OKLAHOMA-KANSAS

Pipe Line Statement for September

Runs

Company—	Month	Dy. Av.
*Prairie P. L. Co.	4,440,000	148,000
Gulf P. L. Co.	1,520,497	50,683
Texas P. L. Co.	979,100	32,637
Magnolia Pet. Co.	1,800,476	60,016
Cosden P. L. Co.	1,043,868	34,795
Empire P. L. Co.	1,413,135	47,104
*Sinclair P. L. Co.	2,937,000	97,900
Oklahoma P. L. Co.	3,972,701	132,423
*Other lines	9,330,000	311,000
Total September	27,436,777	914,558
Total August	29,968,654	966,729

Shipments

Company—	Month	Dy. Av.
†Prairie P. L. Co.	5,321,180	177,373
Gulf P. L. Co.	1,037,883	34,596
Texas P. L. Co.	1,030,794	34,360
Magnolia Pet. Co.	1,822,192	60,740
Cosden P. L. Co.	1,128,668	37,622
Empire P. L. Co.	1,064,708	35,490
†Sinclair P. L. Co.	2,665,421	88,848
Oklahoma P. L. Co.	3,686,355	122,845
*Other lines	7,650,000	255,000
Total September	25,406,211	846,874
Total August	27,725,815	894,380

Stocks

*Prairie O. & G. Co.	30,600,000
*Prairie P. L. Co.	2,000,000
Gulf P. L. and Gypsy Oil Co.	9,525,009
The Texas Company	5,044,860
Magnolia Pet. Co.	6,062,711
Cosden P. L. Co.	3,188,696
Empire P. L. Co.	4,670,658
*Sinclair Crude Oil Pur. Co.	20,000,000
Oklahoma P. L. Co.	2,585,504
Carter Oil Co.	15,988,647
*Other lines	10,000,000
Total September	109,566,085
Total August	107,372,988
Difference	2,193,097

*Estimated. †Prairie Pipe Line shipments include Texas crude oil and Sinclair Pipe Line shipments include Texas and Wyoming crude oil.

Note: Stocks do not include approximately 5,000,000 bbls. of crude oil held in storage on private tank farms and leases, and approximately 1,750,000 bbls. of Texas Panhandle crude held in storage in Kansas and Oklahoma.

EASTERN PIPE LINES

Runs From Wells

In the following table will be found the regular receipts from wells by various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for August and September:

	Aug. '27	Sept. '27
National Transit	146,479.36	148,770.19
S. W. Pa. P. L.	86,548.23	85,669.19
Eureka P. L.	395,237.23	386,201.76
Buckeye P. L. (Macksburg)	343,331.35	324,616.49
Buckeye P. L. (Cleveland)	11,953.23	11,430.57
Buckeye P. L. (Lima, etc.)	129,837.26	124,867.84
Indiana P. L.	8,905.59	9,160.58
Cumberland P. L.	267,515.04	245,038.71
N. Y. Transit	25,028.15	22,882.06
Tidewater P. L.	197,502.70	188,881.97
Pure Oil	164,866.70	159,336.57
Emery P. L.	59,569.14	57,479.57
Paragon Dev.	30,553.65	24,062.15
Pittsburgh P. L.	4,824.41	4,956.74
Stoll Oil Ref.	15,831.15	15,215.87
Total	1,886,983.19	1,808,560.83
Daily average	60,870.43	60,285.39

Note—Indian Refining Co. also reported other receipts of 375,293.93 bbls. Paragon Refining Co. had other receipts of 202,741.28 bbls. Paragon Development had other receipts of 24,753.46 bbls.

Petroleum Deliveries

The following tables exhibit the shipments or regular diliveries of various pipe lines in New York, Pennsylvania, West Virginia, Ohio, Kentucky and Indiana for August and September:

	Aug. '27	Sept. '27
National Transit	344,799.78	352,363.94
S. W. Pa. P. L.	343,310.98	352,236.47
Eureka P. L.	198,755.14	181,601.67
Buckeye P. L. (Macksburg)	153,543.57	144,078.47
Buckeye P. L. (Cleveland)	727.48	971.43
Buckeye P. L. (Lima, etc.)	748,093.86	861,075.42
Indiana P. L.	868,709.30	840,001.40
Cumberland P. L.	150,223.42	141,790.84
N. Y. Transit	289,844.19	316,049.51
Northern P. L.	196,331.58	188,878.47
Tidewater P. L.	150,113.65	133,684.94
Pure Oil	205,913.45	176,414.97
Emery P. L.	54,557.91	59,423.76
Paragon Ref.	177,675.03	202,284.12
Indian Ref.	379,066.52	343,722.80
Paragon Dev.	31,192.30	26,388.53
Pittsburgh P. L.	5,395.27	5,410.12
Total	4,298,243.43	4,326,377.16
Daily average	138,653.01	144,212.57

Gross Stocks

The gross stocks held by various pipe lines in the oil producing sections of New York, Pennsylvania, West Virginia, Ohio, Indiana and Kentucky at the close of August and September:

	Aug. '27	Sept. '27
National Transit	1,129,180.77	1,154,733.90
S. W. Pa. P. L.	683,536.32	648,789.30
Eureka P. L.	1,949,985.99	1,803,065.25
Buckeye P. L. (Macksburg)	416,688.27	421,560.39
Buckeye P. L. (Cleveland)	39,918.38	50,809.14
Buckeye P. L. (Lima, etc.)	4,668,115.54	4,829,631.04
Indiana P. L.	620,873.22	621,233.99
Cumberland P. L.	591,843.81	614,472.24
Southern P. L.	429,471.58	466,091.05
N. Y. Transit	460,922.97	507,169.10
Northern P. L.	470,103.63	534,035.12
Pure Oil	395,429.71	400,830.33
Emery P. L.	13,506.50	12,401.24
Paragon Ref.	15,696.20	15,860.76
Indian Ref.	93,156.64	122,910.52
Paragon Dev.	6,821.39	6,145.06
Pittsburgh P. L.	3,864.26	2,978.00
Total	11,989,115.18	12,212,716.43
Increase	636,987.21	223,601.25

Grades of Oil

The following table shows the amount of the different grades of oil held by the eastern pipe lines at the close of August and September, showing the gross stocks of the above fields:

	Aug. '27	Sept. '27
Pennsylvania	4,238,474.19	4,235,065.02
Lima	1,018,062.71	1,078,066.53
Kentucky	1,134,623.10	1,144,347.96
Mid-Continent	5,531,964.28	5,691,414.41
Illinois	65,894.90	63,822.51
Total	11,989,115.18	12,212,716.43

Daily Average Runs

The following table shows the daily average runs of the Pennsylvania, Lima and Kentucky oil fields for the past four years:

	1924	1925	1926	1927
Jan.	62,638	56,831	55,630	56,209
Feb.	68,023	60,606	60,394	61,298
Mar.	68,721	60,575	61,644	63,247
April	71,058	63,062	63,019	60,337
May	63,942	59,217	60,589	60,284
June	63,230	61,270	64,131	62,757
July	64,208	62,639	63,206	58,574
Aug.	59,942	59,686	61,815	60,870
Sept.	62,930	62,510	64,639	60,285
Oct.	64,976	60,995	62,704	.....
Nov.	56,282	59,350	61,774	.....
Dec.	55,814	57,974	58,755	.....

Daily Average Shipments

The following table gives daily average shipments from the Pennsylvania, Lima and other fields for the past four years:

	1924	1925	1926	1927
Jan.	145,518	157,889	156,056	141,227
Feb.	148,732	160,863	159,488	138,534
Mar.	147,098	154,591	150,239	133,777
April	147,611	151,429	152,371	140,227
May	134,997	146,995	160,998	144,894
June	143,010	149,467	160,257	149,772
July	124,187	161,338	160,945	151,350
Aug.	123,120	161,730	151,929	138,653
Sept.	127,325	156,719	158,915	144,213
Oct.	123,170	145,388	161,132	.....
Nov.	124,400	143,582	152,668	.....
Dec.	151,392	150,162	136,428	.....

Gross Stocks

In the following table will be found the gross stocks of the various lines of the Pennsylvania, Lima and Kentucky oil fields, including oil received from other lines at the close of each month for the past three years:

	1925	1926	1927
Jan.	11,353,276	9,959,170	9,718,000
Feb.	11,192,924	9,579,354	10,119,163
Mar.	11,158,297	9,438,292	10,794,044
April	11,062,082	9,805,851	11,113,296
May	11,207,562	9,531,757	11,359,881
June	11,093,796	9,585,904	11,493,673
July	11,067,453	9,734,687	11,453,138
Aug.	10,974,481	9,668,947	11,989,115
Sept.	10,781,753	9,433,732	12,212,716
Oct.	11,086,850	9,269,806	.....
Nov.	11,068,158	9,257,667	.....
Dec.	10,458,445	9,454,512	.....

Franklin Pipe Line Co.

The following table exhibits the condition of the Franklin Pipe Line at the close of business for the months named and not counted in the stocks and averages reported above.

1926—	Runs	Shipments	Stocks
Sept.	2,788.18	3,373.06	13,985.68
Oct.	2,991.86	2,307.75	14,671.33
Nov.	2,810.60	1,664.55	15,817.31
Dec.	2,847.52	5,561.11	13,103.72
1927—			
Jan.	2,641.54	1,470.42	14,274.84
Feb.	2,764.30	1,082.82	15,956.32
Mar.	2,587.20	1,878.56	16,664.96
April	2,834.23	1,512.65	17,986.54
May	2,768.47	539.29	20,215.72
June	2,946.29	664.40	22,497.61
July	3,153.39	1,276.61	24,374.39
Aug.	3,057.89	8,713.11	18,719.17
Sept.	3,309.56	2,656.48	19,372.25

The Illinois Field

The following table gives the report of the Illinois Pipe Line Co. in Illinois:

Gross stocks, October 1	2,062,018.91
Other receipts	242,655.73
Runs from wells	591,009.13
Regular deliveries	405,432.70
Other deliveries	483,089.11

The amount of Illinois oil run by the Tidewater Pipe Co. in September was 32,580.36 bbls. and deliveries were 27,779.79 bbls. Adding these figures to those of the Illinois Pipe Line Co. makes the runs and deliveries as follows:

1926—	Runs	Deliveries
September	688,798.56	516,082.96
October	681,648.96	531,467.38
November	651,263.33	498,439.37
December	668,909.58	587,947.61
1927—		
January	621,421.03	530,085.98
February	595,831.16	476,960.71
March	727,593.91	554,947.43
April	593,225.97	444,818.49
May	728,759.40	543,192.03
June	640,975.85	532,217.71
July	613,901.30	484,902.53
August	651,276.40	529,331.97
September	619,589.49	433,212.49

Tidewater Pipe Co., Ltd., also delivered in September 218,229.09 bbls. of Oklahoma oil.

AVERAGE DAILY RECEIPTS OF CALIFORNIA OIL AT ATLANTIC AND GULF COAST PORTS

Average bbls. per day—	ATLANTIC PORTS						GULF COAST PORTS						
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total		Total All Ports
June	25,567	11,233	48,833	17,367	17,367	120,367	.....	.....	.....	.....	.....		120,367
July	13,484	17,290	33,065	9,129	5,451	78,419	.....	.....	.....	.....	968		79,387
August	18,516	3,065	48,129	17,323	26,000	113,033	.....	.....	.....	.....	.....		113,033
September	23,033	6,967	51,400	14,567	19,533	115,500	.....	.....	.....	.....	.....		115,500
October	20,936	4,355	47,968	14,129	14,387	101,774	.....	.....	.....	.....	.....		101,774

AVERAGE DAILY IMPORTS OF PETROLEUM AT PRINCIPAL UNITED STATES PORTS

Average bbls. per day—	ATLANTIC PORTS						GULF COAST PORTS						
	Baltimore	Boston	New York	Philadelphia	Others	Total	Galveston	New Orleans Baton Rouge	Port Arthur Sabine Pass	Tampa	Total		Total All Ports
June	18,167	9,700	83,867	10,900	16,567	139,200	2,000	31,800	.....	.....	33,800		173,000
July	22,226	10,387	80,193	7,193	38,710	158,710	3,226	25,065	806	.....	29,096		187,806
August	19,323	9,032	80,903	14,258	31,821	155,387	2,097	21,161	.....	.....	23,258		178,645
September	28,033	11,433	85,500	12,800	37,700	175,467	5,667	19,233	....	3,600	28,500		203,967
October	26,064	13,097	79,355	3,838	34,097	156,451	1,613	19,323	806	1,871	23,613		180,064

GROSS PRODUCTION OF THE UNITED STATES FOR 12 MONTHS

(IN BARRELS)

1926—		California	Oklahoma	Texas	Kansas	Arkansas	Louisiana	Rocky Mountains	Eastern Fields	Total
October:	Month	18,966,058	15,720,689	19,001,388	3,714,637	4,625,138	2,166,559	3,071,720	3,398,000	70,664,189
	Daily average	611,808	507,119	612,948	119,827	149,198	69,889	99,088	109,613	2,279,490
November:	Month	19,172,128	15,876,350	18,593,160	3,593,490	4,299,480	2,054,911	2,842,587	3,216,000	70,649,706
	Daily average	639,104	562,565	619,772	119,783	143,316	68,497	94,752	107,200	2,354,990
December:	Month	20,276,950	17,882,908	19,753,591	3,654,156	4,266,189	2,018,734	2,658,301	3,313,000	73,823,829
	Daily average	654,095	576,868	637,212	117,876	137,619	65,120	85,752	106,871	2,381,414
1927—										
January:	Month	20,184,872	19,035,426	18,605,363	3,769,879	4,076,469	1,905,570	2,620,303	3,332,500	73,530,382
	Daily average	651,125	614,046	600,173	121,609	131,499	61,470	84,203	107,500	2,371,948
February:	Month	17,982,711	19,752,348	16,483,712	3,352,076	3,574,256	1,784,104	2,385,135	3,007,200	68,321,542
	Daily average	642,240	705,441	588,704	119,717	127,652	63,718	85,183	107,400	2,440,057
March:	Month	19,835,724	22,480,921	18,232,617	3,675,143	3,852,920	2,032,982	2,476,798	3,335,800	76,923,905
	Daily average	639,862	725,191	588,149	118,553	124,320	65,580	79,574	105,100	2,449,158
April:	Month	19,493,825	22,208,130	17,801,140	3,516,930	3,378,240	1,994,330	2,615,770	3,474,000	74,482,365
	Daily average	648,870	740,271	593,371	117,231	112,608	66,491	87,193	115,800	2,482,745
May:	Month	19,506,054	23,258,463	19,539,083	3,704,314	3,493,669	1,935,175	2,742,588	3,467,000	77,646,346
	Daily average	629,238	750,273	630,293	119,494	112,699	62,425	88,471	111,839	2,504,721
June:	Month	19,181,442	22,830,330	18,299,810	3,437,580	3,365,760	1,880,820	2,592,437	3,330,000	75,018,179
	Daily average	639,381	761,011	613,327	114,586	112,192	62,694	86,414	111,000	2,500,606
July:	Month	19,319,021	26,522,546	17,607,194	3,454,082	3,406,683	2,279,405	2,635,607	3,373,000	78,597,538
	Daily average	623,194	855,566	567,974	111,422	109,893	73,529	85,020	108,806	2,535,401
August:	Month	19,279,131	26,283,350	17,715,229	3,424,570	3,242,600	3,199,905	2,530,065	3,608,406	78,283,250
	Daily average	621,907	847,850	571,459	110,470	104,600	70,964	81,615	116,400	2,525,266
September:	Month	19,064,500	24,111,660	18,322,800	3,342,240	3,032,970	2,027,070	2,238,609	3,345,000	75,484,849
	Daily average	635,483	803,722	610,760	111,408	101,099	67,569	74,620	111,500	2,512,823
Total 12 months		232,371,910	256,943,731	220,055,087	42,639,097	44,615,374	24,279,545	31,409,820	40,199,900	892,434,036

PROGRESS

IN the field of *transportation* nothing indicates progress more clearly than the time required for a message to travel from New York to Boston: In 1789, by coach, 7 *days;* in 1927, by air mail, 9 *hours.*

In the field of *oil-industry pumps,* nothing indicates progress more clearly than a comparison of present-day models with those in use before GASO entered the field.

GASO Pumps are unmatched for oil-industry service because they are designed exclusively for oil-industry use. The GASO organization lives in the heart of the industry; knows the conditions under which the pumps must operate; concentrates its energies on the fulfillment of oil-industry needs.

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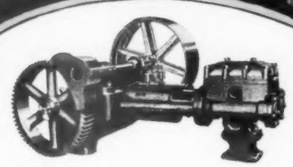
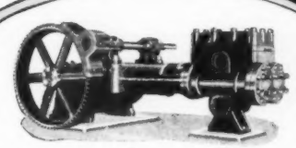
GASO PUMP & BURNER MFG. COMPANY
Tulsa, Okla.



GASO GEAR-DRIVEN PUMPS
An Important Factor in Gaso Leadership

These pumps are carefully designed, strongly made and thoroughly inspected before shipment. No. 501 [at left] is a Horizontal Duplex Piston Pump designed for 200 to 800 lb. working pressure. It has large, direct, unobstructed fluid passages and valve areas.

No. 508 [at right] is an inter-changeable liner type of Gaso Duplex Piston Pump. Quickly changeable from large-capacity, low-pressure service to small-capacity, high-pressure service. Has fewer but stronger parts.



GASO PUMPS
for every oil industry need

HAYNES BROTHERS, Contractors believe in using a HUGHES TOOL JOINT on every joint of pipe

Photograph shows:
J. E. Senter and J. E. Roden, Drillers, for Haynes Bros.—Contractors

on

Roxana Petroleum Co.'s Smith No. 1, Bowlegs Field, Seminole, Oklahoma,

with 6″ Hughes Tool Joints on every joint of pipe.

HUGHES TOOL COMPANY

Service Plants
Los Angeles, Calif.
Oklahoma City, Okla.

MAIN OFFICE AND PLANT
HOUSTON, TEXAS

Export Office
New York City, N.Y.